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Agriculture.

THE IMPORTANCE OF AGRICULTURAL SHOWS.

The importance of shows in an agricultural country cannot be over-estimated. They not only give the farmer an incentive to improve his stock, but they supply him with a standard to work for, and, in addition, teach him the best methods to use to attain that standard. One thing the farmer has to learn is: That, as far as the production of milk-producing and meat-bearing animals is concerned, to stand still is to retrograde. There must be a continual search for improvement and progress; and the main direction of improvement for production, as well as breeding, will be along lines of increased application of scientific methods. No *progressive* farmer blessed with the normal amount of common sense can shut eyes to the fact that without the aid of science, especially as applied to machines, he cannot hope to secure a safe position. Milking machines, butter churns, cream separators, ploughs, planters, flax-scutching machinery, &c., have all been brought to such a standard of perfection that their non-use is not only unreasonable but blameworthy. The show affords progressive farmers an excellent opportunity of seeing and judging for themselves the best breeds to aim for—the best machines to get to help in increased production or to lower the working costs on the farm. The opportunity presents itself of examining to his own satisfaction—learning the costs of using and up-keep without risking a cent in advance. But shows play their own part as well. They cultivate rivalry and emulation; they are a real means of education in stock breeding; for no farmer, no matter how lackadaisical he might be, could look at the parading of fine stock without registering a vow that he would go one better next time, at the same time getting a better and more accurate knowledge of how to go about it.—"Farmers' Journal," Vol. 2, No. 49.

THE COTTON INDUSTRY.

The Brisbane "Daily Mail" for 11th March published the following cablegram from London which will doubtless prove of interest to Queensland cotton growers *in esse* and *in posse*. "Replying, in the House of Commons, during the debate on international trade, to Mr. George Roberts, who emphasised the importance of strengthening the inter-imperial ties, and improving the cultivation of cotton in India and Africa, Sir Robert Horne pointed out that, in addition to manufacturers agreeing to pay 6d. per bale for cotton used in England, the Government had promised

£50,000 a year for five years to develop the cultivation of cotton in the Empire, and also proposed to improve the export credit scheme guaranteeing 85 per cent. of the merchants' selling price. He proposed to extend the scheme to the Dominions. He agreed that the Dominions should be placed first.'' This should open the eyes of Queensland farmers to the prospect of making this portion of the British Dominions a great cotton-growing country. The cultivation of cotton has, years ago, passed the experimental stage, for, during the American war, there were exported from Queensland to Great Britain 26,000,000 lb. of ginned cotton, worth £1,300,000, and had there been linting machines in use as there are to-day, this return would have been largely increased. For want of this machine, a vast quantity of short fibre remaining on the seed would have been removed, and could have been sold at that time for little less than the full price of cotton in the English market. The cleaned seed was thrown away as valueless, there being no oil mills in Australia, and 30,000,000 lb. of seed, valuable for its oil, then worth over £50,000, together with the oilcake, 2,600,000 lb., worth another £50,000—all went to the manure heap.

In those days the farmer obtained from 2½d. to 3d. per lb. for his cotton, and unless his crop was picked by the family, he paid ½d. per lb. for the work. The returns of a cotton crop are now greater than when any sort of seed was sown. The Department of Agriculture imported seed of the best and heaviest bearing varieties from America, with the result that one acre to-day produces half as much fibre again as the old varieties.

GROUND ALMOND—"CYPERUS ESCULENTUS."

G. B. BROOKS, Instructor in Agriculture.

In February, 1919, the writer was given a few nuts of the ground almond. This plant is a member of the Cyperus family, which also embraces the notorious weed nut grass (which is really a sedge and not a grass).

As the ground almond has a habit of growth similar to nut grass, it was decided to raise a number of plants, thereby ascertaining whether it was likely to become a pest under cultivation. Half a dozen tubers were, therefore, planted out in March. As this is a summer-growing crop, the season was really too far advanced for planting; consequently, the yield was light, each plant producing some two dozen small tubers or nuts. The best of those were selected for a further trial, planting in this instance being carried out in September, 1920; the soil being a brown friable loam. A quick germination resulted; the subsequent growth being also rapid, the plants stooling out in a remarkable manner and attaining a height of 2 ft. 6 in.

During the first week in February a stool was dug up and photographed, the soil first being carefully washed away, leaving only the tubers and fine fibrous roots. (See illustration.)

It will be noted from the photograph that the plant is a very prolific one. From the stool illustrated—which was grown from a single tuber—730 tubers or nuts were removed. Those are shown in illustration, Plate 17.

The tubers are attached to the plant by runners 2 to 3 inches long. When harvesting, a number of nuts are likely to be left in the soil, and, being small, are difficult to locate. Therefore, unless great care is taken in digging, the plant is likely to become a troublesome pest in cultivation.

The labour entailed in harvesting the crop, if raised for market purposes, would be both tedious and expensive.

The nuts, when dry, have a very agreeable flavour, but being somewhat fibrous cannot be masticated like the peanut.

The following extracts dealing with this plant, taken from the works of various authorities, are of interest:—

F. v. Mueller (in ''Select Extra Tropical Plants''):—''*Cyperus esculentus.* Habitat: Southern Europe, Western Asia, various parts of Africa. Produces the 'chufa' or ground almond, an edible root which contains about 27 per cent. starch, 17 per cent. oil, and 12 per cent. saccharine substance. Other (French) analyses give 28 per cent. oil, 29 per cent. starch, 14 per cent. sugar, 7 per cent. gum, and 14 per cent. cellulose. The plant does not spread injuriously like the *C. rotundus* (nut grass), and can be reared on sand land, though in rich soil the harvest is more plentiful. The tubers, of which as many as 100 to 150 may be obtained from each plant, are consumed either raw or cooked. Hogs root them up for food. The oil surpasses, in excellence of taste, all other oils used for culinary purposes. The tubers

Plate 16.—Ground Almond (*Cyperus Esculentus*).
Showing Crop of Tubes or Nuts.

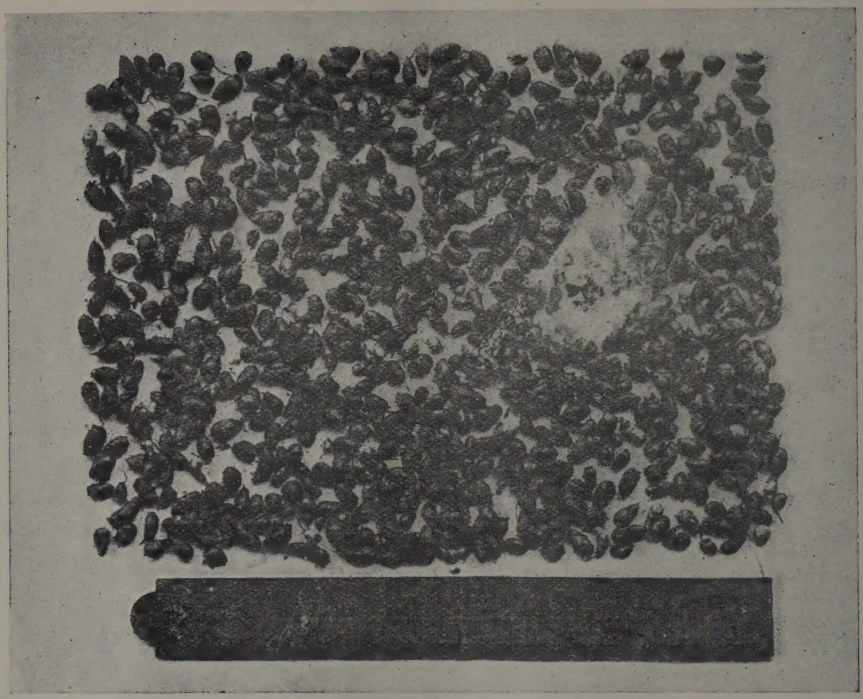


PLATE 17.—GROUND ALMONDS (*Cyperus Esculentus*).
Returns from one Stool or Plant.

are a fair substitute for coffee when properly roasted. The root crop is available in from four to six months. The plant may become important in the most dreary and arid desert countries through naturalisation. *C. esculentus* and *C. exaltatus* are used for mats.''

L. H. Bailey (''Cyclopedia of American Agriculture''):—''Chufa (*Cyperus esculentus*), sometimes known as earth almond. A perennial sedge that is frequently a noxious weed in low, damp places on Southern farms. It produces an abundance of small, cylindrical, underground tubers. The tubers or nuts are much relished by hogs. The hogs are generally turned on the field and allowed to harvest the crop. When cultivated, the nut has a fine flavour if properly dried. The crop does best on sandy soil that has been well fertilised. Heavy soils should be avoided. The rows are 2 ft. to 4 ft. apart, and the tubers set 12 in. to 15 in. apart in the row. The crop is recommended for fattening hogs.''

Dr. Lindley, in one of his botanical works, states that ''the roots of these plants (*Cyperus*) are succulent and filled with an agreeable and nutritive mucilage. The English species (*C. longus*) contains a bitter principle which gives its roots a tonic and stomachic quality. The tubers of *C. Hexastachys* are said to be successfully used in cases of cholera by Hindoo practitioners, who call the plant 'mootha.' Those of *C. Pertunnuis* are, when dried and pulverised, used by Indian ladies for scouring and perfuming their hair. The root of *C. odoratus* has a warm aromatic taste, and is given, in India, in infusions as a stomachic. The roots of some of the species are also used as an article of diet. *C. esculentus* yields tubers which are called by the French 'souchet comestible' or 'Amande de terre,' and are used as food in the South of Europe. According to Dr. Royle, they have been proposed as a substitute for coffee and cocoa when roasted.''

COTTON FROM NEW CALEDONIA.

In a letter from the Cotton Company of Havre on the subject of two shipments of cotton totalling 92 bales from Noumea, New Caledonia, for sale at the former port, published in the ''Revue Agricole'' (a publication issued by the New Caledonian

Chamber of Agriculture) last year, the following remarks on the classification of the shipments occur:—

"This lot is neither superior nor inferior to other arrivals of cotton from Noumea, but it shows a marked decrease in quality relatively to the lowest quality of that of preceding years. We attribute this falling off in quality—

(1) To the exhaustion of the soil, which is noted in all countries where cotton has been grown year after year in the same land.

(2) To the careless selection of the seed for resowing.

(3) To the fact that your planters allow the plants to remain too long without eradication and resowing. In Egypt cotton is resown every year. Your planters might, perhaps, leave their plants for two or three years in the same place; but they make a mistake, to the detriment of an average crop, when they allow the plants to occupy the ground for too long a period.

(4) To the increase in production in New Caledonia, and that, as a consequence, the means of ginning have not been sufficiently developed. The result is that the seed cotton awaits its turn at the ginnery for too long a time, and that, consequently, the oil from broken seeds discolours the fibre and gives rise to fermentation.

"We earnestly ask cotton planters to take serious note of the above observations. Our Caledonian type of cotton rightly is much appreciated by the buyers in the North of France, which is owing entirely to the specific qualities of its fibre, which are:—Length, strength, and elasticity. These are the qualities which must be maintained to ensure the high prices paid for it:—

(1) The cotton plant is an exhausting one, which especially requires potash. In the New Hebrides it is premature to talk of worn-out soils; but for New Caledonia the application of manure is absolutely necessary.

(2) All planters should be careful in their selection of seed. The wisest plan is to have some plants especially grown for seed purposes, and to choose the finest bolls, eliminating all badly-shaped capsules or any that show any defect.

(3) Our tree cottons should certainly not be retained indefinitely. They should be replaced in a very few years—as soon as they fail to yield abundantly.

(4) Our two ginning establishments are well equipped with machinery, and the reason for the cotton being often oil-stained appears to be that the farmers usually pack their crop in immense sacks placed under severe pressure, and the transport is charged at per sack instead of by weight.

"Many of these sacks sent to the gin-houses at Noumea contain up to 100 kilos (220 lb.) of cotton; and, to get that quantity into a sack, such forcible pressure is needed that the seed is crushed and the oil exudes.

"The best remedy for this would be to charge the freight on the actual weight of the consignment, and not on the number of sacks."

[The above is a translation of the French article, and contains some points of information which may well apply to the operations of Queensland cotton growers.—Ed. "Q.A.J."]

YIELD OF COTTON IN INDIA.

A considerable reduction is estimated in the yield of cotton of India for the 1920-21 season. The Department of Statistics, India, in its third forecast places the outturn at 3,621,000 bales of 400 lb. each, as compared with the revised estimate of 5,645,000 bales at the corresponding period a year earlier, or a decrease of 36 per cent. As compared with the final forecast of 1919-20, the present estimate shows a decrease of 38 per cent. The area sown to cotton for the current season is 19,704,000 acres, as against 22,179,000 acres for 1919-20, or a decrease of 11 per cent. The reduced yield is due to the prolonged drought which characterised the season in cotton-growing districts in 1920. The December estimate of the 1920-21 crop of the United States of America was 16,234,000 bales of 400 lb. As regards Egypt, the Ministry of Agriculture, Cairo, states that the weather, on the whole, has been favourable for the cotton crop. The first picking is finished, and the second had been taken in in most places at the time the report was issued. The average yield of the crop is below normal.

Seed Wheat for Disposal.

AT HERMITAGE STATE FARM.

This Department has been experimenting for a number of years with several varieties of wheat as a result of crossbreeding and selection work at Roma State Farm; some have consistently given satisfactory results, very often under adverse conditions. These are now being offered to wheatgrowers, in order that they may have the opportunity of acquiring seed of varieties which have been tested and found suitable to soil and climatic conditions in the wheatgrowing districts of the State.

Orders for the undermentioned varieties (which are illustrated and described elsewhere) should be directed to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Remittance must accompany order, and, in the case of cheques, should have exchange added.

The price quoted for any of the varieties offered is 11s. per bushel, f.o.b. Hermitage.

VARIETIES.—"Inglewood," "Patriot," "The Prince," "Gundi."
(*See* accompanying illustration of three of the varieties.)

In addition to the above a limited quantity of "Amby" is also available at the same price.

Inglewood.—Mid-season variety. This is derived from a cross between Bunge and Federation Wheat, and has given consistent results in the South-Western wheat areas. The plant is of medium height, and on strong soils is inclined to carry a fair amount of flag. It stools well and possesses a straw of medium strength. Heads are of medium length, slightly tapering; non-bearded. The chaff is smooth and light-brown in colour. Grain of medium size, somewhat elongated in appearance; semi-translucent.

Patriot.—Derived from a selection made after crossing Bunge and a Durum wheat. A mid-season variety, of moderate stooling habit. Straw is of medium height and somewhat tough. Flag scanty. Head tapering, non-bearded, open appearance, and of medium length. Chaff smooth and of a pale-golden colour. Grain somewhat short; full-blosomed; semi-translucent.

Plate 18.—Seed Wheat for Disposal.

The Prince.—A selected crossbred wheat; early mid-season variety, of fairly tall-growing habit, suitable for main-crop sowing. A good stooler, and carries very little flag. Head of medium length, open appearance, slightly tapering; non-bearded. Chaff smooth and of a pale-golden colour and somewhat closely attached to the grain, which is plump, full-bosomed, semi-translucent, and of medium hardness. Fairly resistant to rust.

Gundi.—A selection from a Bunge-Federation cross. A mid-season variety suitable for early sowing, of moderate stooling habit. It carries a medium amount of flag. Straw moderately stout and slightly under medium height. Head long and compact. Chaff smooth and light-brown in colour. Grain medium-sized; somewhat rough skinned; white in colour. This variety has given a yield of 37.2 bushels at Roma State Farm. More suited for Western and South-Western conditions than for the Downs.

Amby.—A popular variety suitable for main-crop sowing. It is a hardy mid-season variety and a good stooler, carrying a moderate amount of flag. Ears compact, non-bearded; chaff white and smooth. Grain plump and rather shotty in appearance; semi-translucent. Is an excellent milling wheat and has given good results in the principal wheat-growing districts.

AT STATE FARM, ROMA.

The following varieties of Seed Wheat are available for distribution from Roma State Farm. Price 11s. per bushel; free on trucks, Bungeworgorai:—

"Amby." **"Bunge No. 1."** **"Soutter's Early."**

Limited quantities of the following new wheats are also available at the same price:—

"Cedric." **"Inglewood."**

In the event of farmers desiring to have small quantities not exceeding 1 bushel of new varieties of Roma Crossbreds for trial this season, arrangements for their purchase may be made with the Manager at the same rate—*i.e.*, 11s. per bushel, free on trucks, Bungeworgorai.

Remittance, with exchange added, should accompany order, and be sent direct to the Manager, State Farm.

A NEGLECTED INDUSTRY.

Practically all members of the Capsicum family flourish in Queensland, and in many districts certain varieties are to be found growing wild, being looked upon in the light of mere weed growths. More particularly so is this the case in the smaller variety known as Bird's Eye (*C. minimum*), which is common to the scrub lands of the North, where its growth is phenomenally rapid.

A limited demand exists for this particular variety of the Capsicum family amongst bird seed merchants and cordial and condiment manufacturers; and it is thought that a profitable source of income could be derived from the systematic handling of a crop which flourishes in a wild state, and one which, if given cultivation on up-to-date lines, would well repay the amount of labour expended upon it.

At the present moment supplies of this class of Capsicum are being obtained from Zanzibar and Japan; and it is understood that the former product leaves much to be desired from the point of quality. Whilst we are content to import products of other lands and neglect those of our own which can be produced under the most favourable of conditions, so long will our progress be retarded; but, at the same time, it must be clearly understood that any product which is put on the market to oust that which is being imported must of necessity be equal to and, if possible, superior to it. This is the rock on which, unfortunately, too many are apt to go to pieces; and it is to the consistent producer of a good and reliable article that business will revert, and accounts for the fact that merchants prefer to buy oversea products which can be and are produced here of equal if not superior quality, but lack care and attention and, it might be added, common honesty in packing and placing on the market.

In connection with placing chillies on the market, the necessity of proper drying is emphasised; and with the moist climate of the North, sun-drying cannot be relied upon to produce a perfectly dry berry; consequently, some form of artificial evaporation would be necessary. The erection of a suitable evaporator need present no grave difficulties to the average man on the land who is at all conversant with the use of tools.

Emphasis must also be placed on the manner of harvesting the berries, which ripen somewhat unevenly and must of necessity be picked as they are ready. This necessitates going over the bushes at various intervals, as the inclusion of only partially ripe berries reflects on the bulk, resulting in unevenness of sample, the main source of complaint amongst buyers.

For those who are interested in the production of chillies, the following information may be of interest:—

A rich sandy loam is the most suitable for chillies, although satisfactory crops can be grown on a much heavier class of soil.

The plants are raised in seed beds, and, to produce plants which are hardy, robust, and even in growth, the seeds should be sown in drills spaced 8 in. or 9 in. apart. The bed must be kept watered, using a watering can with a fine "rose," and the plants protected from frost. The land should be ploughed deeply and reduced to a fine tilth; and when all danger from frosts is over, and sufficient moisture is present in the soil, plant out the seedlings when 5 in. to 6 in. in height in rows 3 ft. 6 in. apart, allowing 2 ft. 9 in. between the plants in the rows. Choose a cloudy day and, if possible, showery weather for transplanting.

Frequent cultivation is necessary until the plants become too advanced in height to permit the passage of horse and cultivator between the rows. Keep down all weed growths, and encourage a soil mulch as much as possible.

Picking.—The whole of the plants should be gone over about once a week as soon as the peppers begin to ripen, and all ripe fruit taken off. Care should be taken to pick portion of the stem with the berry. After picking they should be allowed to lie in the sun for a day, in order to toughen the stem and prevent damage to the base of the fruit whilst drying.

Where it is possible, the fruit may be dried effectively on gently sloping iron roofs, but must be carefully removed in the event of weather becoming showery, and must at all times be covered from dampness arising from dew.

Dampness in any form, once the berry has become partly dried, is fatal to the ultimate curing; and for this reason, in the humid climate of the North, evaporators are advocated.

Yields vary with soils and climatic conditions; but when these are favourable 1,100 lb. to 1,300 lb. per acre may be regarded as an average crop.

Present quotations for imported chillies are in the region of 1s. per lb.

For those interested, the following list of bird seed merchants and cordial manufacturers of Victoria may be of service:—

CORDIAL MANUFACTURERS.

Barret Bros., 43-5 Holden street, Fitzroy.
G. M. Brooke and Sons, Whiteman street, South Melbourne.
J. Dickson and Co. Pty., Ltd., 16 Abinger street, Richmond.
P. G. Dixon and Co. Pty. Ltd., 193 High street, Prahran.
G. H. Elliott, 45 Rathdown street, Carlton.
Frankston Springs Co., 34 Drummond street, Carlton.
H. J. Gabble, 179 Clausen street, Fitzroy.
John Gow, Ballarat road, Footscray.
Mrs. E. Gray, Cromwell street, Caulfield.
Richard Gray and Sons, Davison street, Richmond.
R. Harrison, 8 Spring street, Fitzroy.
Harrison San Miguel, 405 Elizabeth street, Melbourne.
Hepburn Spa Pty. Ltd., 314 Collins street, Melbourne.
Mrs. M. A. Jacobson, Geelong road, Footscray.
Marchant and Co., 34 York street, Richmond.
Moonee Valley Cordial Co., Miller street, North Fitzroy.
Robert Moseley, 183 Boundary street, North Melbourne.
O'Neill Bros., 11 Woodside street, North Fitzroy.
O.T. Ltd., 193 High street, Prahran.
F. Rogers, 19 Malmsbury street. Hawthorn.
E. Rowlands Pty. Ltd., 266 King street, Melbourne.
Schweppes Ltd., 39 Lithgow street, Abbotsford.
Sharpe Bros., 31 Garden street, South Yarra.
H. Taylor, 430 Rae street, North Fitzroy.
Wilcox Bros., Dandenong.

BIRD SEED MERCHANTS.

White and Hancock, 296 City road, South Melbourne.
W. J. Purves, 268 Swanston street, Melbourne.
Jas. Railton, 273 Swanston street, Melbourne.
Walters and Sons, 251 Swanston street, Melbourne.
F. H. Brunning Pty. Ltd., 64 Elizabeth street, Melbourne.
Farmer and Co., 474 Collins street, Melbourne.
Moran and Cato, 277 Brunswick street, Fitzroy.
Radcliffe Bros., 42 Victoria street, Brunswick.
Crook's National Store Pty. Ltd.., 217 Commercial road, South Yarra.
C. W. Mitchell, 524 Elizabeth street, Melbourne.
J. D. Howie and Co., 194 Smith street, Collingwood.
Jas. Jones, 204 Chapel street, Prahran.
Law Somner and Co., 139 Swanston street, Melbourne.
Evans Rees, 58 Bourke street, Melbourne.
J. G. Cooke and Co., 182 Commercial road, Prahran.
W. E. Ruttledge, 405 Bourke street, Melbourne.

Messrs. Henry Berry and Co., of Melbourne, are also buyers of bird's-eye chillies for the manufacture of cayenne pepper. Inquiries have also been directed to this Office by Mr. V. A. Wawn, manufacturing chemist, 44 Elizabeth street, Sydney, who is anxious to obtain reliable supplies.

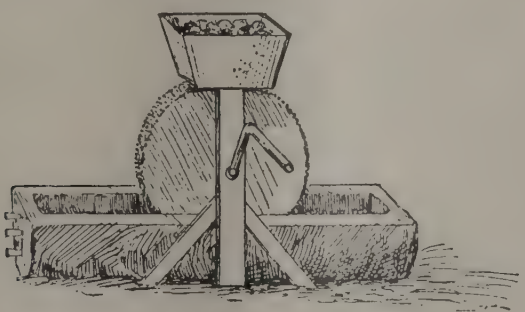
THE CULTIVATION AND MANUFACTURE OF ARROWROOT ON THE FARM.

In the dim past, arrowroot was grown on a small scale for home consumption, and it is surprising that while there are many farm products largely made use of for household purposes, and which do not require the aid of expensive machinery, arrowroot, the safest of semi-tropical crops and the least expensive to manipulate, should be neglected. There are two varieties of arrowroot which are grown in this State—viz., *Maranta arundinacæ* and *Canna edulis*, known to growers as White and Purple Arrowroot. Both are bulbous plants, but the purple sort is a far heavier bean than the white. It is from the bulbs that the arrowroot of commerce is obtained. The bulbs of the purple variety vary in size from 6 in. to 12 in. in circumference.

The smaller bulbs are used for plants. Wide furrows, about 6 in. deep, are run out about 4 ft. apart, and the bulbs are dropped in from 2 ft. to 3 ft. apart and covered by the plough or hoe. Planting time is about the months of September and

October. The plants grow rapidly, and in about three months attain a height of 5 to 6 ft. Meanwhile the bulbs are growing in a cluster around the base of the stem, to which they are firmly attached. From six to eight months bring the crop to maturity. A touch of frost aids it by shrivelling up the tops and concentrating the starch in the bulbs. When the tops wilt without frost the crop is ripe. The mass of bulbs to be dug up is so heavy that strong forks are needed for the purpose.

The only preparation for extracting the starch is to first thoroughly wash the bulbs, after which they are grated into pulp under water. The grater is a primitive affair made of a side of a kerosene tin, or a stronger one is made out of galvanised iron into which holes have been punched, with the rough grating side outward. The operator then grates the bulb against this, allowing pulp and starch to go into the water. The bulb is then quickly reduced to a dark brown mass of fibry-looking pulp. The starch being heaviest sinks to the bottom. The pulp, being lighter than the starch, floats almost to the surface of the water, and is easily removed. A good plan is to cover the tub or tin with porous linen and to grate the bulbs over this. The pulp remains on the linen, whilst the starch passes through it. When a certain quantity of bulbs have been grated (always into the water), one or more tubs are made ready to receive the starch from the first. This is worked by hand until the starch, further cleansed, has passed through the linen. If then not sufficiently cleansed, it is worked through another receptacle until no more feculencies are seen. When the starch, which always keeps at the bottom, is perfectly clean it is spread out in the sun or in a dry room upon cloth, and thus freed of the last remnant of moisture. When perfectly dry, it may be put into bags or boxes, and will keep even for years in good condition. For production on a large scale as to-day practised by arrowroot growers, special ingenious machinery is employed, reducing the expense of the cost of production, while the quality is improved, as it is scarcely handled from the time of leaving the field.



The yield of bulbs of the purple variety varies from 10 to 15 tons per acre, and 1 ton of bulbs gives rather more than 1 cwt. of manufactured arrowroot. The white variety (Bermuda arrowroot) is grown and manufactured in the same way as the purple, but the yield is much less. All this is very simple. Enough arrowroot can be produced on a very small plot of land to supply a family for a year or more, and the manufacture can be carried out doing wet weather when rainy weather prohibits work on the farm. A simple machine was made by the writer some years ago, which accelerated the process of grating.

The primitive machine which we used for arrowroot production was home-made, and answered the purpose admirably. First, a log of about 2 ft. in diameter and 8 ft. long was hollowed out by axe and adze into the form of a trough. At the head of this trough was fixed a framework much like the wooden stand of a grindstone, only, of course, much taller. A large wheel was then cut from a perfectly sound gum log, 3 ft. in diameter and 1 ft. wide. Tin plates, turned into graters (requiring frequent renewal), by punching holes in them with a flat, wrought-iron shingle nail, were nailed on to the edge of the wheel, to which a stout wooden axle and windlass handle were attached. The wheel was fixed so as to revolve in the water with which the trough was filled.

On top of the framework was a wooden hopper, in which the washed bulbs were placed, falling on the grating wheel. One man turned this with ease, and the bulbs, thus rapidly grated, fell into the trough in the shape of pulp and starch. The former was removed by a scoop, and the latter subsided to the bottom. The water was then gradually drawn off by removing successive pegs inserted into the lower end of the trough. The starch was then dug out and washed in the usual way. Such a machine is quite good enough for making arrowroot for home use. A consignment of arrowroot thus produced we sent to London and sold it at 2s. per lb.

Such a machine would answer equally well for grinding cassava.

Pastoral.

SHEEP BLOW-FLY DEMONSTRATION.

A demonstration in connection with the blowfly pest will be given at Dalmally Station during the second week in April. Many Queensland pastoralists, and also some from New South Wales, are expected to attend. The object of the demonstration is to illustrate the methods adopted at Dalmally to combat the ravages of the sheep fly.

The Horse.

THE PERCHERON: A BRITISH HORSE.

The Percheron horse became only known when the omnibuses of Paris began to use a grey horse bred in the Perche, Picardy, Flanders, and Poitou; and this horse became one with a real good reputation around 1848. Those who wrote about him from that time were Charles de Sourdeval, Ephrim Houel, Charles du Hays, Napoleon de Saint Albin, Eugene Gayot, and Andre Sanson.

Charles de Sourdeval says that the Percheron breed has had all its good qualities from a bay stallion coming from the Cotes du Nord. This stallion was Young Rattler by Old Rattler and a Snap mare. He had been imported in 1820 to France by M. Wollaston, who had a stud farm at the Chateau de Crenan, ner Quintin, Cotes du Nord. This horse was born in 1811, and lived till 1836.

This Young Rattler had a great many sons, all dapple greys, who were standing in Normandy and Perche, among them Regrette, Antenor, Malplaquet, Meriadec, Pegase, Young Antenor, Eminence, Mortagne, Oxigene, Envie, Francois I., Heliotrope, Oscar, Birmingham, Gorlitz, Herbouville, Ulysse, Flibustier, Opicrinus.

According to Ephrim Houel, the importation of Sandy in the Perche made a noted improvement to the breed. This Sandy was a grey stallion coming from England, and he was the sire of two extra good stallions—Conquerant and Sandy.

Another English stallion, Pretender (1829-1842), had a grey son, Omar, who was standing in the Perche. And then another Pretender, born also in England, in 1859, and standing in France from 1865 to 1881, sired the greys Grison, Ardoise, and Coquelicot, who were also used in the Perche country.

The Norfolk Phenomenon, born in England in 1845, and used in France from 1851 to 1872, has a grey son, Obligeant, who also was used in the Perche district.

The Percheron horse owes, then, most of his qualities to the Hackney breed of England. This is absolutely sure, as the proofs are given here.

Charles du Hays did not say that the Percheron horse was descended from the Arabian horse. He wrote: "He has that beautiful grey robe of the Oriental horse," but nothing else.

Eugene Gayot, who has been the most prolific writer on French horses during the nineteenth century, does not give an Arabian origin to the Percheron horse. His opinion is that the Perche country was the sole factor able to make a Percheron horse, even if the colts were imported from the Cotentin, the Vendee, and the Poitou:—"Britons, Boulonneses, Bourbourians, Flemish, Cauchois, Piccards, &c., are becoming Percherons under the climate and conditions of the Perche."

If England wants now to make a cart horse that is able to trot, the foundation stock should be the English Hackney sire crossed on draught mares. By selection and feeding, the Hackney horse could be turned into a light draught horse. In Belgium around 1885-1890 the best light draught horses, named Ardennese, were made by using a Belgian horse on a Hackney mare. The Belgian horse himself is only an overgrown Hackney; he has the same points, the same action, but he weighs 700 lb. more. This is proof that the Hackney must have been used in the creation of the Belgian horse, and if he can make such a heavy horse he must be able to make a lighter one—*i.e.*, a cart horse that is able to trot.—"Farmer and Stockbreeder."

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, FEBRUARY, 1921.

There was a remarkable decrease in the output during the month, due to the number of birds in moult. The laying of the groups was satisfactory, and, if anything, there is not so much moulting taking place in this section as amongst the single hen pens. Among the latter it is noticeable that the birds that have been troublesome through broodiness are the ones that are moulting, and also, at the same time, taking a longer period to come into lay again. There were two deaths during the month. Mrs. Anderson lost her E. bird from ovarian trouble, and E. A. Walters his through snakebite. The following are the individual records:—

Competitors.	Breed.	Feb.	Total.
LIGHT BREEDS.			
*Geo. Trapp	White Leghorns	116	1,418
*O. W. J. Whitman	Do.	104	1,388
*Haden Poultry Farm	Do.	87	1,372
*J. M. Manson	Do.	117	1,363
*J. Newton	Do.	107	1,352
*Quinn's Post Poultry Farm	Do.	94	1,337
*L. G. Innes	Do.	114	1,332
Mrs. R. Hodge	Do.	119	1,323
*W. Becker	Do.	93	1,322
*J. J. Davies	Do.	84	1,319
Geo. Lawson	Do.	86	1,319
*Dr. E. C. Jennings	Do.	87	1,319
*N. A. Singer	Do.	78	1,314
*E. A. Smith	Do.	106	1,301
*T. Fanning	Do.	111	1,296
*W. and W. G. Hindes	Do.	112	1,268
*G. Williams	Do.	92	1,259
*J. H. Jones	Do.	88	1,259
*H. Fraser	Do.	95	1,253
*Thos. Taylor	Do.	109	1,243
*Mrs. L. Anderson	Do.	86	1,233
*B. Chester	Do.	79	1,219
*Mrs. L. Henderson	Do.	100	1,217
S. L. Grenier	Do.	100	1,215
*S. McPherson	Do.	84	1,195
Thos. Eyre	Do.	94	1,186
*Range Poultry Farm	Do.	75	1,158
E. Chester	Do.	96	1,147
Avondale Poultry Farm	Do.	113	1,139
H. P. Clarke	Do.	112	1,130
*S. W. Rooney	Do.	86	1,127
S. Chapman	Do.	110	1,118
R. C. J. Turner	Do.	92	1,097
C. Langbecker	Do.	83	1,095
H. A. Mason	Do.	112	1,092
W. Morrissey	Do.	88	1,091
C. M. Pickering	Do.	82	1,063
C. A. Goos	Do.	113	1,039
W. D. Evans	Do.	102	1,021
C. H. Towers	Do.	70	1,015
A. J. Andersson	Do.	77	977
Miss E. M. Ellis	Do.	Withdrawn	583

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Feb.	Total.
HEAVY BREEDS.			
*R. Burns	Black Orpingtons	90	1,354
*A. Shanks	Do.	98	1,352
*E. F. Dennis	Do.	84	1,325
*R. Holmes	Do.	65	1,283
*E. Morris	Do.	97	1,277
*A. Gaydon	Do.	60	1,247
*D. Fulton	Do.	78	1,237
*J. Cornwell	Do.	100	1,227
H. M. Chaille	Do.	94	1,207
*W. Smith	Do.	83	1,192
*A. E. Walters	Do.	64	1,164
Mrs. G. H. Kettle	Do.	112	1,161
*E. Oakes	Do.	62	1,156
Parisian Poultry Farm	Do.	95	1,148
*R. B. Sparrow	Do.	84	1,142
J. E. Smith	Do.	80	1,129
*T. Hindley	Do.	67	1,128
G. Muir	Do.	98	1,110
R. C. Cole	Do.	71	1,086
*J. E. Ferguson	Chinese Langshans	79	1,026
*E. Stephenson	Black Orpingtons	70	1,021
*Nobby Poultry Farm	Do.	49	976
G. Flugge	Do.	103	943
Total		5,836	77,405

* Indicates that the pen is being single tested.

RESULTS OF SINGLE PEN TESTS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
G. Trapp	245	239	257	214	243	220	1,418
O. W. J. Whitman	224	219	255	233	206	251	1,388
Haden Poultry Farm	250	190	236	248	220	228	1,372
J. M. Manson	203	236	245	238	227	214	1,363
J. Newton	249	219	236	165	242	241	1,352
Quinn's Post Poultry Farm	248	232	233	195	202	227	1,337
L. G. Innes	174	212	233	250	249	214	1,332
W. Becker	234	225	235	219	193	216	1,322
J. J. Davies	238	226	227	190	232	206	1,319
Dr. Jennings	165	258	201	207	230	258	1,319
N. A. Singer	238	186	225	259	211	200	1,314
E. A. Smith	220	176	239	218	218	230	1,301
T. Fanning	118	233	220	238	249	238	1,296
W. and W. G. Hindes	197	221	186	231	218	215	1,268
J. H. Jones	213	208	218	228	212	180	1,259
G. Williams	191	217	222	213	233	183	1,259
H. Fraser	150	218	230	227	224	204	1,253
Thos. Taylor	237	209	178	227	201	191	1,243
Mrs. L. Anderson	245	227	220	190	162	189	1,233
B. Chester	218	187	225	187	212	190	1,219
Mrs. Henderson	182	205	215	192	222	201	1,217
S. McPherson	243	246	91D	138	252	225	1,195
Range Poultry Farm	143	182	215	255	177	206	1,158
S. W. Rooney	168	176	220	168	190	205	1,127

RESULTS OF SINGLE PEN TESTS—*continued.*

——	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Burns	231	215	262	197	225	224	1,354
A. Shanks	191	243	215	270	187	246	1,352
E. F. Dennis	240	216	184	253	213	219	1,325
R. Holmes	202	206	211	222	238	204	1,283
E. Morris	222	217	219	177	226	216	1,277
A. Gaydon	195	263	206	174	170	239	1,247
D. Fulton	218	219	198	233	92	277	1,237
J. Cornwell	209	227	214	141	201	235	1,227
W. Smith	110	241	217	225	204	195	1,192
A. E. Walters	187	194	175	214	164	230	1,164
E. Oakes	174	242	178	102	220	239	1,156
R. B. Sparrow	209	137	210	183	176	227	1,142
T. Hindley	203	236	198	174	146	176	1,128
J. E. Ferguson	144	169	129	180	218	186	1,026
E. Stephenson	192	158	200	183	149	139	1,021
Nobby Poultry Farm	190	258	86	262	160	20	976

CUTHBERT POTTS,
Principal.

POULTRY CONFERENCE AT THE QUEENSLAND AGRICULTURAL COLLEGE, 19TH MARCH, 1921.

In compliance with the request expressed at the last Poultry Conference, held in September, 1920, the date of meeting was altered to March. Unfortunately, there were several conflicting appointments in the poultry world last Saturday; further, the weather was threatening; in consequence, there was not as large an attendance as might have been expected. However, as so often happens in these cases, the matter for discussion and the result arrived at are likely to be of exceptional value to all poultrymen.

On arrival the visitors were received by the Principal of the College, Mr. Cuthbert Potts, B.A., and the College Poultry Instructor, Mr. Harwood.

The morning was devoted to an examination of the competition birds and a general discussion on type, period for hatching, feeding, and general poultry management. It is impossible to give a report of this section of the conference; but it cannot be stressed too strongly that the mutual interchange of ideas and experience is of vast importance to those poultrymen who attend these conferences. This value of the meeting is certainly greatly amplified because of Mr. Harwood, a keen enthusiast, who has under his control each year the birds of some seventy different breeders. When Mr. Harwood talks on the various characteristics of these competing pens, it is an education.

After lunch, all present assembled in the lecture hall; and the Principal, as chairman, placed before the conference a suggestion for the inclusion of a cockerel test. In the course of his remarks Mr. Cuthbert Potts pointed out that the idea of this test was not altogether new. It had been strongly advocated at the last conference in September, 1920. As illustrating that others had arrived at the same conclusion—viz., that a cockerel test was essential if we were to obtain a permanent improvement in our poultry—Mr. Potts read a paragraph from the "Feathered World," stating that the Harper-Adams Agricultural College was about to institute a male bird test. It was claimed that the Harper-Adams College was the first to move in this direction; but he thought that this claim might not be entirely correct, as the date of the "Feathered World" was 10th December, 1920; whereas a possible cockerel test had been outlined at our September conference.

The scheme was then briefly outlined, and was subjected to keen criticism. Finally, it was unanimously agreed that the competitors present would support the scheme; and the details of the contest were left for the College to draft out.

In effect, the test will be somewhat as follows:—

Several leading competitors in the current competition, whose birds conform to type, weight of egg, &c., will be offered the opportunity to have a cockerel tested.

The breeding of any such cockerel must be known and stated.

The bird will be mated with three of the competitors' best pullets, as determined in the current test, and also with three approved indiferent layers.

During the mating season each pullet will be trap-nested until a sufficient number of eggs has been obtained to ensure that, on incubation, at least six pullets will result from each individual mating.

These pullets will be trap-nested for the full next year, commencing from 1st April.

Should all the female progeny of any cockerel prove to be high producers, such cockerel will receive a certificate by seal ring, and all his male progeny out of the proved high producing mothers will also be retained. One or more of them may be carried on for further test or they may be sold for the owner under the College supervision.

By the above test it is hoped to demonstrate whether high fecundity is transmitted by the male bird, and, if so, to establish a strain whose male birds will have a hearted support.

It is to be hoped that all poultrymen will give this proposed test their whole-hearted support.

PUBLIC CURATOR OFFICE.

A BUSINESS PROPOSITION FOR THE FUTURE.

All over Queensland there are families whose happiness is the result of foresight of men who while still living have made wise provision for the future. There are over 12,000 of these men who have made wise provision for the future of their families by making Wills, appointing the Public Curator their Executor and Trustee.

One of these men, who is typical of many others, looked into the face of his loved ones and thought:—"They are happy now; but how can I ensure their happiness in the years to come?"

He made a Will. For his wife, inexperienced in business matters, he placed a trust fund to protect her against the tragedy of ill-advised investments. For his children's education, he set aside a special fund. For his boys, he provided that their whole share of the estate should be paid to them at a matured age. For his daughters, he provided that their shares should be kept in trust during their lives, so that, married or single, they would be financially independent.

Then came the question: Who was to carry out these trusts? He decided that it would be unfair to his wife to ask her to manage property, which it had taken his utmost labour and efforts to accumulate; nor did he think it a fair thing to appoint any of his friends, no matter how trustworthy they might be, Executors under his Will, for they might die at any time, and throw the administration of his estate into hopeless confusion.

This prudent man appointed the Public Curator of Queensland Executor and Trustee, because he had attributes and powers which no private person had, such as State guarantee, continuous existence, accumulated experience, financial responsibility, perfected machinery of administration, and an experienced legal staff to carry out all the legal work of administration without extra cost to the estate.

Therefore, to-day, long after this man's death, the Public Curator is serving his family from year to year, his officers acting with understanding of each individual's needs, while observing a strict impartiality.

As this man made provision, so any man can provide, in proportion to his desires and means, for his family's future.

A pamphlet giving full information concerning the Public Curator Office may be had on application, either to the Public Curator in Brisbane, to his Local Deputies at Rockhampton and Townsville, or to any Clerk of Petty Sessions in the State.

Elizabeth street, Brisbane,
25th February, 1921.

Dairying.

WHAT THE BULL MEANS TO THE HERD.

"South Downer" contributes the following advice to dairy farmers in England (in the "Live Stock Journal"), which should also be considered by Queensland owners of dairy herds:—

With the lesson "Pedigree Pays" so constantly before his eyes in 1920, we must hope that the ordinary tenant-farmer—the man who, although anxious that his cows should yield well, yet rather turns up his nose at pedigree—will learn the obvious lesson and endeavour to build up a herd of pure-bred cattle.

To the man with a real love for well-bred stock the type of bull used in the past in such herds has been somewhat appalling, the axiom "anything will do so long as he gets a calf" having been carried to the extreme limit; but, luckily for the good of the breeds in this country, this pernicious notion is fast dying out, and there seems to be a real desire on the part of the small man to grade up his stock to a higher level.

The influence of a good bull on a herd can hardly be over-estimated, for he has it in his power to make or mar its future progress in the world.

Authorities on breeding are in agreement that a breeder will never advance his herd on the upward path unless he employs bulls of better class than his own females, and this, therefore, should be the aim of the farmer.

Where milk is desired only pedigree bulls of proved milk-yielding strain should be used, and preferably a bull whose heavy milk-yielding ancestors go back as far as the third dam on each side. "Breed both ways for milk," say some of the older farmers, and experience has proved them right.

That great judge of Dairy Shorthorns, Mr. R. W. Hobbs (now, unhappily, deceased), in speaking of the selection of a bull, said: "My advice is in every case to secure the best, and before making a purchase see his dam if possible. One should not be satisfied with the milk record only, but should also be assured that the bull comes from a good cow with a shapely udder. . . . . The purchaser must be most particular that the sire of his bull likewise comes from a good milking family, and it will be much in the bull's favour if heifers by his sire can be seen showing good udders and milking well." Advice from such a source is worth its weight in gold to the ordinary man.

The unrestricted slaughter of calves has seriously depleted our stock of milch cattle, and now it behoves our farmers when building up the stock to breed only the best. The whole world is in keen competition for our pedigree stock. Never has there been such a world-wide demand, and it is up to us to satisfy it, and maintain our proud position as the "stud farm of the world."

It is being done, and can continue to be accomplished, certainly without the aid of imported stock, which would prove to be but the "thin end of the wedge." That is an innovation British farmers must sturdily set their faces against.

But in speaking of the bull as "half the herd" we must bear in mind that it is well-nigh useless to expect improvement in the herd unless it is found out which cows are of no use in the herd, and this can easily be done by means of carefully kept milk records.

By the careful weighing of each cow's milk morning and evening, in a little while it can be discovered which cows should be disposed of as quickly as possible. It is waste of time to feed the unprofitable cow; moreover, there is no place for her in this workaday world of utility cattle. She should be fatted out and sold.

Once more, may we say that while so much depends upon the wise choice of a bull, yet we must not forget that we owe it to the sire to give him a decent foundation stock on which to build. It is only by such means that we can hope to form a really successful herd.

HOW DAIRYING PAYS.

A correspondent at Dorrigo (New South Wales), who owns a herd of twenty-one cows, states that his butter returns from these cows averaged 9 lb. per cow per week. At 2s. 2½d. per lb., he received £85 from the factory in the month of December, 1920. Thus each cow was worth £4 odd. With reference to this, Mr. Graham, Chief Dairy Expert, Department of Agriculture, Queensland, states that several herds within this State have yielded an average of butter-fat quite equal to and, in some cases, slightly higher than that mentioned by the Dorrigo dairy farmer.

PIG FEEDING WITH JUDGMENT.

A light and sparing diet should be given after farrowing, as many sows are feverish. Gruel, oatmeal porridge, whey, and such like should be the diet until the sow regains some of her strength. In a case of being debilitated and requiring strength, strong soup, bread steeped in wine or in a mixture of brandy and sweet spirits of nitre, administered in small quantities, will often prove beneficial. Gradually the rations must be increased and given more frequently. They may consist of all kinds of roots, carrots, turnips, potatoes, and beetroot, well steamed or boiled, and never given raw. Bran, barley, oatmeal and bean flour, Indian corn, whey, sour milk and butter milk are all perfectly adapted for this period.

Should the animal appear to require it grain, well bruised and macerated, may also be added. Bean flour is considered by many to create an abundance of milk, and there are some who think barley meal is too stimulating, and they advise that it should never be used alone, but always one-third oatmeal to two-thirds of the barley meal. Whenever it is possible the sow should be turned out for an hour each day to graze in a meadow or clover field, as the fresh air and exercise and herbage will do her an infinity of good. The young pigs should be weaned when they are from eight to ten weeks old. Some are weaned as early as six weeks. The weaning should be done gradually, being allowed to suck six times a day, then four times, and at last only once.

There is little doubt that many cases of sickness occur among pigs through their being fed upon food which, in regard both to quantity and quality, would be better suited to the late autumn or winter season than to the present time. At those seasons demands are made upon the system which call for a good supply of rich food to keep up the bodily heat of the animals and enable them to withstand the effects of cold and inclement weather. In summer the conditions are changed, the animal heat being kept up with little effort, and thus it is that a lighter diet should be fed to the pigs during hot weather. Instead of giving them their food in a thick porridge-like mass, as is the case in winter time, thin it down well with some good sweet whey, kitchen slops, or waste milk. The animals will drink this with a relish, and it will be better for them in every way than thick, heavy food.

It makes all the difference in the profits whether the sow produces good strong pigs and then feeds them well, or produces a litter of weaklings and then has nothing for them to eat; whether her system is nice and cool, or feverish and hot. In the one case she will be good-natured and let the pigs suck, and will furnish plenty of milk; in the other, fretful and peevish, and the chances are that she will eat her pigs as soon as born. These conditions depend very largely, if not entirely, upon the way the sow is treated and fed during pregnancy. It is an almost unheard of occurrence for a brood sow running out on good pastures ever to eat a pig. Sows are not cannibals by nature, and are only made so by the ignorance or foolishness of the owner. The best food for a sow is coarse wheat middlings or reground bran, or bran and middlings may be mixed half-and-half, which should be made into a stiff mass with skim milk if possible; if not, with the house slops or water.—"Live Stock Journal."

DRYING TOMATOES.

There are many ways of drying that perfect esculent, and thus preserve it under a condensed form, easy to keep, easy to carry, and most handy to use.

The best known is the following, given us some time ago by Mr. H. A. Tardent when manager of Westbrook State Farm:—Take good, fleshy tomatoes and place them in a tinned copper boiler. Boil over a moderate fire until the skins separate from the flesh; then pass through a sieve to strain off the skins and seeds. Then boil again to evaporate as much moisture as possible without burning. Then pour out on to plates, saucers, or shallow dishes (for commercial purposes, square, specially-made moulds are better, as the dried tablets thus pack well in cases). The pulp should not be thicker than in half-inch layers. Then expose to sun and wind, taking care to cover the moulds with sheets of butter-cloth, as flies are apt to deposit eggs in the pulp.

Stir, also, occasionally, the crust which forms on the surface, as otherwise the moisture cannot escape, and this would engender mouldiness under the crust. The process is greatly hastened by finishing the drying in a cool oven, or, if available, in an evaporator. When the tablets are thoroughly dry, let them cool, and pack in airtight boxes.

The Orchard.

INTERSTATE CONFERENCE OF FRUITGROWERS AND GOVERNMENT FRUIT EXPERTS.

An Interstate Conference of fruitgrowers and Government fruit experts, convened by the Commonwealth Government, was recently held in Melbourne. There were present:—Messrs. W. J. Hannaford (representing South Australian growers); G. Quinn (South Australian Government); R. W. Peacock (New South Wales growers); Allen (New South Wales Government); Wayman (Queensland growers); Lang (Victorian growers); Carmody (Victorian Government); Scott (Tasmanian growers); Ward (Tasmanian Government); Boardman (Australian Fruitgrowers' Conference), Meeking (Commonwealth Government); Wickens (Western Australian Government); and Ramage (representing Western Australian growers).

After consideration the following resolutions were carried and forwarded to the Minister for Trade and Customs:—(1) That this conference affirms the desirability of adopting standardised methods of grading and packing apples and pears for export for overseas markets. (2) That the standards for packing and grading apples, and also for sizes and measurements of apple and pear packages, be in accordance with the following:—

Apples.

(1) They shall be packed in three grades; (2) they shall be packed in packages of prescribed sizes; (3) the packages shall be legibly and durably branded with the following:—(*a*) The initials of the christian name and full surname and address of the grower or exporter or his registered brand, or, in the case of a firm or corporation, with the firm or corporate name and address or registered brand, on one end of the package in letters of not less than one-half an inch in length; (*b*) the designation of the grade ("Extra Fancy," "Fancy" or "Choice," as the case may be) in letters of not less than one-quarter of an inch in length on printed paper labels, and not less than three-quarters of an inch if stencilled on cases. (4) Apples for export must be graded into one of three grades—viz., "Extra Fancy," "Fancy," and "Choice" —specific details of which are set out hereunder. The fruit in all grades shall be so packed that the outer layers or shown surfaces shall be a true indication of the average grade of the fruit throughout the package. Apples of only one size and one variety shall be packed in any one case of any grade. (5) "Extra Fancy" apples shall consist of sound, clean, well-formed apples. They must be free from all insect, fungus, visible bitter pit, and other blemishes. Full coloured varieties of this brand shall have each apple coloured to the extent of not less than one-half (50 per cent.) of its skin with good red colouring. Striped varieties must not have less than one-third (33⅓ per cent.) of their surfaces coloured with distinct red stripes or streaks. Yellow and green varieties shall be even in colour, but may show flushes of another colour where such are natural to their respective kinds. "Fancy" apples shall consist of sound, well-formed apples, free from visible bitter pit and serious blemishes (excepting blemishes caused by rubbing, black spot, or caterpillars). A maximum of 10 per cent. of the whole of such apples in a case shall be allowed black spot markings not exceeding in extent upon each such apple the area contained in a circle of which the diameter is one-quarter of an inch. Full coloured varieties of this kind shall have each apple coloured up to the extent of at least one-third (33⅓ per cent.) of its skin with good red colour. Striped varieties shall be distinctly striped or streaked over not less than one-tenth (10 per cent.) of their skin surfaces. Yellow or green varieties shall be even in colour, but may show flushes of another colour where such are natural to their respective kinds. Not more than one-tenth (10 per cent.) of the fruit in a case may carry blemishes. "Choice" apples shall consist of apples true to name, skin unbroken, reasonably free from visible bitter pit. Slightly blemished apples may be packed, but such blemishes shall not exceed 20 per cent. in a case. A maximum of 10 per cent. of the whole of such apples in a case may be allowed black spot markings not exceeding in extent upon each apple the area contained in a circle of which the diameter is three-eighths of an inch. Russeting of the apple not to be considered a blemish. (6) The apples in each grade shall be in size as follows:—"Extra Fancy," not less than 2½ in. in diameter, excepting that normally small varieties may consist of specimens of not less than 2¼ in. in diameter. "Fancy," not less than 2¼ in. in diameter. "Choice," not less than 2 in. in diameter. The size of the fruit contained shall be marked on the package in figures of not less than one-quarter of an inch on

printed labels, and not less than three-quarters of an inch if stencilled on the case. A variation in size to the extent of one-quarter of an inch, that is one-eighth of an inch above or below the marked size, may be allowed, except in the case of minimum sizes.

PEARS.

(7) Pears must be graded in similar grades to apples, and each package shall only contain pears of a uniform size, without restriction as to size of any variety in the "Choice" grade. Provided that a variation of not more than one-quarter of an inch—that is, one-eighth of an inch above or below the marked size, may be allowed. Colour requirements need not be considered as are required for apples. Other requirements as to blemishes and black spot shall apply equally to pears and apples in the respective grades.

SIZE OF PACKAGES.

(8) In all bushel cases a variation of 6 per cent—that is, 3 per cent. under or 3 per cent. above—of the total cubic capacity of the case may be allowed.

(9) Apples and pears for export shall be packed in one of the following packages:—

Australian bushel—18 in. long by 14½ in. deep by 8⅝ in. wide.

Canadian bushel—20 in. long by 10 in. deep by 11½ in. wide.

Flat bushel—26 in. long by 14½ in. deep by 6 in. wide—clear of divisions.

Three-quarter flat bushel—24 in. long by 11⅝ in. deep by 6 in. wide—clear of divisions.

Australian half bushel—18 in. long by 8⅝ in. deep by 7⅛ in. wide.

Half flat bushel—26 in. long by 7⅛ in. deep by 6 in. wide—clear of divisions.

Pear tray—18 in. long by 3¼ in. deep by 14¼ in. wide.

Pear tray—18 in. long by 2⅞ in. deep by 14¼ in. wide.

The measurements given are to be the inside dimensions of the cases.

FERTILISERS FOR FRUIT.

When it is considered that the yearly production of fruit in an orchard is a continuous system of cropping, and is even more exhaustive than ordinary mixed farming, the need for fertilisers can be easily understood. Artificial manures are necessary to restore fertility, and it must also be borne in mind that the stimulus given to growth by judicious manuring enables fruit plants to withstand disease and adverse conditions.

With the extension of fruitgrowing within recent years, more attention has now to be given to the production of a larger proportion of first-grade fruit. On soils which are naturally suited for fruit cultures, normal crops of average quality may be grown without fertilisers, but consistent yields of fruit of superior quality can only be got by liberal manuring.

To get the best results the application of fertilisers must be co-ordinated with thorough cultivation. Land intended for fruit growing ought to be deeply cultivated previous to planting; and to ensure good drainage it is advisable to have the subsoil broken up. The trees and bushes should not be crowded closely together. If well set apart there will be a better distribution of air and light around each plant when the orchard reaches maturity. During the growing season the surface under the trees and bushes should be frequently stirred to prevent evaporation, and the intervening space ought to be dug or cultivated at least twice a year.

The fruitgrower must find out for himself the fertilisers which give the best returns under his own particular set of conditions. The essential constituents—nitrogen, potash, phosphoric acid, and lime—have to be applied in amounts suitable for the special requirements of the different fruit crops, and in accordance with the variations of soil and climate. Without an adequate supply of each of these elements of fertility, the best results cannot be expected.

NITROGEN.

Nitrogen promotes a healthy growth of foliage, and this in turn gives rise to a stronger and more extended root system. It induces an early and vigorous development of the buds and young wood. Nitrogenous fertilisers should be used in conjunction with potash and phosphates to ensure a full crop. Stable manure and nitrogenous fertilisers supplying organic matter are very beneficial for young orchards on light soils.

POTASH.

Potash is pre-eminently the fertiliser which produces quality. It forms a large part of the ash of fruit trees, and is really the dominant plant food for the production of fruit crops. It plays an important part in the ripening of the wood and in the setting of the buds and blossoms, and is most essential for the formation of sugar in the fruit. Where potash manures are regularly applied to fruit crops, they grow a stronger and healthier foliage and give a heavier yield of large-sized fruit of exceptionally fine taste, colour, and aroma. It is frequently observed that wine from vineyards manured with potash is of a superior quality.

The different grades of potash salts produced by the Alsatian mines, now under French control, can be relied upon to give good results on all fruit crops. Muriate of potash and French manure salts, 20 per cent. and 30 per cent., are the grades of potash principally used by the viticulturists in France. Applied in this form in the autumn or winter, along with phosphates and organic manures, potash gives a very profitable return.

PHOSPHORIC ACID.

Phosphates exert a considerable influence on the formation of the seed, and subsequently on the ripening of the fruit. They prevent exuberant growth of wood and foliage, and promote development of the buds and flowers.

LIME.

Lime counteracts acidity in the soil and helps to break down organic manures. As a base it sets free plant food and furthers the action of the fertilisers. It improves the texture of the soil and thereby gives better drainage. Lime is required in considerable quantities by all fruit plants, and more especially by stone fruits. Good results will be got by applying a heavy dressing of lime (12 cwt. to 15 cwt. per acre) every few years.

The productiveness of an orchard depends on so many factors that no hard-and-fast rules can be laid down with regard to manuring and other treatment. Under average conditions, however, the following quantities of fertilisers have given consistently good returns:—

Potash.—1½ cwt. muriate of potash or 3-4 cwt. French manure salts, 20 per cent., per acre.

Phosphates.—2 cwt. superphosphate or 3-4 cwt. basic slag per acre.

Nitrogen.—1-2 cwt. sulphate of ammonia per acre.

FERTILISERS FOR APPLES AND PEARS.

Both apples and pears may be grown successfully on any average soil if it is well drained, but generally the better the soil the heavier the yields. They readily exhaust the available plant food in the soil, and consequently often deteriorate into bearing a crop only every other year. To obtain successive crops of apples and pears it is necessary to apply complete well-balanced manures. Green manuring, or an application of well-rotted dung, 10 to 15 tons per acre, along with a dressing of phosphates and potash in the autumn after pruning, will prove very beneficial.

The following proportions of artificial manures are recommended:—

Per acre (distributed broadcast).—2 cwt. of superphosphates, 4 cwt. French manure salts, 20 per cent.

Per tree, for young orchards (distributed round the trees).—1½ lb. of bone meal, 1 lb. muriate of potash, 1 lb. sulphate of ammonia.

STONE FRUITS (PLUMS, PEACHES, CHERRIES, DAMSONS, APRICOTS, Etc.)

These fruits do best on rich, deep loam, overlying calcareous sandstone. They require a soil which is neither too wet nor too dry. Stone fruits are readily damaged by dry conditions. To prevent this, the surface soil should be kept loose by constant hoeing. As a good deal of lime is required for the formation of the stone, regular dressings of lime should be given if the soil is not naturally calcareous.

The following manures give good results on stone fruits:—

Per acre.—3 cwt. of bone meal, 3-4 cwt. French manure salts, 30 per cent.

Per tree, for young orchards (distributed round the trees).—2 lb. bone meal, 1 lb. muriate of potash.

Stable manure at the rate of 15 tons to the acre should be given in the autumn in addition to the above fertilisers.

BUSH FRUITS (CURRANTS, GOOSEBERRIES, RASPBERRIES, ETC.).

These bush fruits flourish best on good fertile land. They are gross feeders and require an abundance of nitrogenous manure. The application of farmyard manure at the rate of 20 tons to the acre, and liquid manure at the rate of 3 gallons to the square yard, will give excellent results. A liberal dressing of potash and phosphates at the following rates is also necessary:—

Per acre (applied in the autumn on early winter).—4 cwt. of French kainit, 14 per cent., or 3 cwt. French manure salts, 20 per cent., 4 cwt. superphosphate, 30 per cent., or 5 cwt. basic slag.

STRAWBERRIES.

The best soils for strawberries is a rich, sandy loam, provided it does not dry up too readily. In spring they should receive a dressing of lime between the rows to check insect pests, and afterwards a heavy mulch of cow dung. The fertilisers advised for bush fruits give good results on strawberries.

CITRUS FRUITS (ORANGES, LEMONS, GRAPEFRUIT, ETC.).

The ideal soil for citrus fruits is a light retentive loam with good natural drainage. A very sandy soil is unsuitable because it does not retain moisture very well, and fertilisers become washed out of it too readily. As citrus trees are deep-rooted, it is necessary that the soil should be free and open so that the roots can penetrate downwards.

In order to prevent the too rapid evaporation of moisture, every effort should be made to keep the surface soil round the trees in a loose, pulverised condition. It is also advisable to plough in cover crops to maintain the humus content of the soil, as the wastage of organic matter is very rapid in the warm districts where citrus fruits are grown.

Of the fertilisers required for citrus fruits, potash is by far the most important. It is of the highest value for the proper growth and health of the trees and for the formation and ripening of the fruit. Light soils are generally deficient in potash, and heavy soils do not as a rule contain it in a very suitable form.

Young trees on light soils should receive a complete manure containing the following percentages:—

3 per cent. nitrogen, 5 per cent. phosphoric acid, 5 per cent. potash. At the rate of 1 to 3 lb. per tree.

For trees over six years.—1½ cwt. sulphate of ammonia, 1½ cwt. superphosphate, 2 cwt. muriate of potash, per acre.

VINES.

The grape vine requires a good deal of moisture under ground, but it does not do well on cold, water-logged soils. The best vineyards are on well-drained slopes where the soil is rich in lime. A deep, free loamy soil is most desirable for grape vines.

Vines respond well to good treatment, but require complete, well-balanced manures. The excessive use of nitrogenous manures without a sufficiency of phosphates and potash will readily produce insipid fruit, which will not keep well. Grapes are rich in sugar, and as potash is essentially the element required for the production of sugar, it is of prime importance as a fertiliser for vines.

Farmyard manure has a very beneficial effect on vines, and it can be applied at the rate of 10 tons per acre along with the following fertilisers:—

½ cwt. sulphate of ammonia, 3 cwt. basic slag, 4 cwt. French potash salts 30 per cent., per acre.

Insufficient manuring is a common cause of unfruitfulness in orchards and plantations. To make fruitgrowing a paying concern, it is most essential to have regular and early crops of good marketable fruit. These requirements can only be met by applying liberal dressings of organic manure supplemented by artificials.

NOTES ON LEMON-CURING.

We have lately received inquiries from various sources with reference to the preservation of lemons for market, and we cannot do better than republish some notes on this subject by Mr. Daniel Jones, who obtained the information from the late Mr. W. S. Williams, of Doncaster, Victoria. Mr. Williams was the most successful grower of lemons in that State, handling about 6,000 cases annually. He explained

that to carry out the process of lemon-curing as here outlined, does not require the expenditure of much capital; an intelligent orchardist by use of a little native ingenuity can very easily devise for himself a cheap if rude construction as well adapted for the storage of citrus fruit equally as well as may be possible in the more pretentious and costly constructions. The chief thing to keep in view is that thorough ventilation, by means of as constant a current of cool air as it is possible to obtain, is the prime desideratum. Probably more depends on this item in the process than on any other, while it is very necessary that in cutting your fruit from the trees all possible precautions must be observed to handle without bruising: be the care ever so great in the field, in the event of imperfect ventilation taking place in the storage cellar the presence of the carbonic acid gas which generates, as is usual when fresh fruit is stored, will inevitably destroy the product, by reason of defective arrangement for the ventilation of the cellar. An extract from the "Melbourne Leader" will convey more tersely than I can describe them the points I wish to emphasise and which I fully endorse.

A good deal of attention is being paid this year to experience in lemon-preserving. All sorts of theories about dipping in all sorts of solutions are being promulgated, and some of them may contain the germ of successful methods. It ought to be borne in mind, however, that the most successful lemons, as regards quality and distant trade, are those of Sicily, and these are not dipped or "preserved" at all. The method consists of cutting the fruit while yet green and allowing it to ripen in darkness, with an equal temperature and perfect ventilation. The Sicilian lemons carry round the world, and preserve their delicate appearance without any dipping or other external application of chemicals. That ours will do the same has been abundantly proved even in Parramatta, where, writes a Sydney exchange, the greatest lemon-preserving failure of last year took place. But in that case the untoward result was occasioned by neglect of the simplest principles of ventilation. The lower portion of the storeroom was airtight, and there were gratings, &c., overhead. The gas generated by the fruit, being much heavier than atmosphere air, persisted obstinately in lying on the floor, and gradually rising as it increased in quantity, so that presently the lemons were soaking in a bath of carbonic acid gas. The same course ruined many shipments of citrus fruit on the way to England. But lemons laid on the floor of cellars with due provision for a current of air from below have kept for many months, and preserved all the freshness of appearance, while acquiring that peculiar shade of colour which connoisseurs insist on. Probably some processes will claim to be successful simply because the other surroundings have been suitable. In any case, the grower who provides himself with a storeroom which can be kept dark and well ventilated, while the temperature is consistently low, may feel quite sure that he can keep his lemons all right, and be ready for a good market when it offers.

THE CELLAR.

The building used for curing the fruit is a combination of a cool cellar and packing-house. It is built on an elevation where good drainage is possible, as this is a factor that must not be overlooked in constructing a curing-house. Damp floors, damp walls, and such conditions will adversely affect the curing processes.

The cellar in this instance is excavated to a depth of 9 ft., and is 18 ft. wide and 35 ft. in length. The walls of the whole structure are 20 ft. in height, which permits of the occupation of the above-ground portion for ordinary purposes. The walls are built of brick and are double, with a 2-in. space between, which provides the needful ventilation, gratings being let into the wall near the floor at every few feet, through which a constant current of air is passing. The floor is of single brick, with effective provision for drainage beneath—a matter of importance. The roof is of galvanised iron. There is nothing in the structure but what any ordinary tradesman or handy man can easily and cheaply construct; an ingenious man may vary the method of construction to suit his local circumstances either in material used or expenditure. The principal object in view is the construction of a cellar by which the temperature can be lowered to about 53 to 57 degrees Fahr., the range of heat Mr. Williams finds favourable in Victoria for successful curing of both lemons and oranges.

The method adopted in gathering the fruit is to clip the lemon carefully as near to the fruit as possible, pack into ordinary cases, which are conveyed to the packing-house and remain for a couple of days in the cases before being transferred to trays in the cellar. The lemons are cut when just turning yellow, and when cured the short piece of stalk left on will drop off the fruit if just touched by the finger, which is one way in which Mr. Williams determines the curing stage. The usual time taken to cure is from seven to eight weeks, sometimes longer, and is dependent somewhat upon the character of the season and the crop. Lemons thus cured will keep for twelve months, a sufficient time to meet all commercial demands. The lemons after a couple of days are removed and laid, without any packing, in shallow trays that

hold but one layer of fruit. The form of tray most favoured is one constructed from the Maryborough orange case cut in half; this, in Mr. Williams' opinion, is the ideal curing-tray. These are now packed one on top of the other in the cellar, and, save for an occasional overhaul to remove any faulty fruit, are left in this state until required for market.

TINNED PINES.

The recent cabled criticisms of carelessly canned Australian pineapples have had a stimulating effect in the direction of improving the trade. In a letter published early this week, one English buyer of Queensland pines acknowledged that the last consignment he received was vastly superior to those which he handled a year or so ago. The Queensland State cannery also has made some wonderful improvements in its plant and processes. The result of these reforms was lately demonstrated, when the Trade Commissioner, in the presence of a few enthusiasts, opened for comparison various tins of pineapples. Some of these samples were from the State cannery and others were from Hawaii. It was found that the Queensland article was quite equal to the famous Hawaiian, not only with regard to flavour, but also in its general get-up. That this high standard of locally tinned pines is a recent accomplishment is shown by comparing a tin taken from this season's lot with a tin taken from an old pack. The improvement is largely due to the fact that the obsolete machines which produced the old unsatisfactory results have been scrapped, and the new Ginaca machines, similar to those used in Hawaii, installed in their place. New, smartly labelled tins also add to the appearance of the goods turned out. Tinned fruit of indifferent quality, badly graded and carelessly packed, has had in the past a bad effect on the English market, and Queensland pines, in common with other lines, have suffered in the United Kingdom. But these defects are being speedily eliminated, and, according to Mr. W. H. Austin, there is now "nothing on the English market to beat the present product of the State cannery."—"Daily Mail."

PACKING FRUIT FOR EXPORT.

It was lately reported from Murwillumbah (N.S.W.) that a consignment of bananas from Queensland arrived by sea in a "boiled" condition. As some that were sent by train were similarly affected, the blame could not attach to the shippers. About 120 cases sent from Woombye and 63 from Currumbin arrived in this condition. The consignment from Woombye was all dumped at the growers' expense, and 28 cases of the Currumbin consignment realised a total of £7, and the balance 12s. per case, when the market rate for good fruit was 21s. per case.

It is evident (the report adds) that in some instances neither train nor boat is responsible for the damage, but a lack of care by the growers. Recently a consignment of bananas was dumped at Murwillumbah Station three days before the departure of the boat from Byron Bay, and these were "boiled" before they were placed in the truck. Care is necessary to ensure that the fruit is carefully picked in a proper condition and is given every protection during transit.

A SPLENDID MANGO.

Mr. Edwin Allen, of Merton street, South Brisbane, brought to this Office, on 7th March, a very fine mango weighing 2 lb. 5 oz. Another one from the same tree weighed 2 lb. 9 oz. The lighter one was 9 in. long, and measured 11½ in. in circumference. Unfortunately, nearly all the fruit was destroyed by the hailstorm. The stone was 6½ in. in length. The tree is supposed by Mr. Allen to be a sport, but this will be decided later on, as some of the seed (or stone) has been planted. There is very little fibre in the fruit, but the full flavour of the ripe mango is not pronounced.

LEMON GROWING.

Mr. W. H. Lambert, Paddington, is a successful lemon-grower. Last June his trees bore a crop of rough lemons in clusters of six, as depicted in the issue of this Journal for June, 1920. This year the trees have borne exceptionally well, many of the branches carrying a cluster of eleven marketable fruits. It was intended to give an illustration of them, but they, unfortunately, all fell off before they could be photographed. With the exception of numbers, the fruit was of the same quality as those of last year.

Horticulture.

SEEDS WHICH SHOULD NOT BE SOWN FRESH.

There are flower and vegetable seeds which quickly lose their germinative power, and must be sown fresh. On the other hand, seeds of the Cucurbitaceæ—such as melons, cucumbers, &c.—are recommended to be sown when several years old. For early sowings of turnips it is necessary to sow old seeds. The influence of time on the germinating value of seeds is a well-established fact; and it is hardly possible to account for this influence otherwise than by the theories put forward by Jules Rudolph in a paper published in the "Revue Horticole" in 1903, in which he stated that in a book, published anonymously in 1765, he found the following passage about stocks:—

"Many amateurs and professional gardeners are certain that stock (Giroflée) seed kept for five (5) or more years give a larger percentage of doubles than fresher seed. Taking for granted that this is really a fact, the reason is that the seeds which can only produce single stocks decay, losing their germinating power sooner than the others. So old seed will, in fact, produce fewer plants, but of the plants produced there will be a greater percentage of doubles."

How far can we now believe this statement, made as long ago as 1765? According to traditional belief, it is better to use for some vegetables and flowers seeds from two to five years old. Why? Old gardeners say that new seeds produce plants less shapely, running more quickly to seed, and of such vigour that they do not preserve all their true characteristics, while seed two or three years old give more shapely plants, with less tendency to run to seed. I believe in this, and will try, if possible, to explain it.

All plants, or, I should say, most of them, have the power of reproducing themselves from seed, with their own characteristics, but at the same time they are influenced by atavism, which tries to make them revert to the specific types from which they came. Thus in the seed of some varieties two forces struggle—the one tending to make them revert to the primitive type, the other tending to reproduce certain acquired characters more or less fixed by selection. It is possible that this atavistic force weakens with the age of the seed, as also that abnormal vigour which makes certain plants run to seed if grown from seeds too fresh when sown. This is not the case with stocks. If we admit that double flowering of these plants is a weakness of degeneration, it is easily believed that seeds some years old no longer possess their pristine vigour, and can produce a double flower instead of a single. We have here a real transformation of the seed—a transformation which can be allowed if we remember that the less stocks are let run wild the more chance one has of obtaining double flowers. It is for this reason that stocks are grown in pots in Germany. In this way a much larger percentage of double flowers is obtained than in the case of plants grown in the open. Many growers prefer to use China aster seed one or two years old, saying that by so doing they get more double flowers. But, above all, it is in the kitchen garden that it is necessary to know whether to choose young or old seed according to the species or variety. Thus, for beetroot and carrots, seed two years old should be used to let the root form better and keep the plants from running; for chicory and cabbages three-year-old seed, as then the plants shoot and ripen better. If we do not wish to let spinach, lettuce, or radish run to seed, or differ from the type, we must use two-year-old seed. For corn salad it is necessary to use seed at least a year old, as seed gathered in June will scarcely grow if sown in the following September or October.

DISTRIBUTION OF CANE PLANTS.

We are informed by the General Superintendent of the Bureau of Sugar Experiment Stations that a highly successful free distribution of approved cane varieties was carried out at the Sugar Experiment Station, Bundaberg, on 18th February. The Chemist in Charge (Mr. Pringle) reports that upwards of 160 growers called at the station, and were supplied with new varieties, including Queensland 813, 970, 1098, Java, E.K.1, H.Q. 77, Shahjahanpur No. 10, and others. In addition to this, about 80 growers outside Bundaberg are being supplied by rail.

Tropical Industries.

THE SOUTHERN SUGAR DISTRICTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Southern Field Assistant (Mr. J. C. Murray):—

Throughout the month of February the cane-growing districts of Childers, Pialba, Maryborough, and Yerra have been visited.

CHILDERS.—This district has every prospect of a good harvest. The cane, both plant and ratoon, is still growing rapidly; and the farmers are paying careful attention to cultivating and the checking of weed growth. There is a general feeling of satisfaction in the district, the people considering the difficulties caused by the drought about at an end. Live stock and pasture land also look well, and unemployment is not so rife as in other centres. The returned soldiers are actively engaged in the question of getting Hapsburg and Lynwood Plantations resumed, which, if done, means that numbers of service men would have homes on some of the finest sugar-growing land in Queensland.

Speaking generally on cane varieties and methods associated with cane culture, there is nothing outstanding to comment upon. The 1900 Seedling and D.1135 are still the staple varieties, although Q.813 is beginning to find considerable favour amongst the growers. A row of this cane planted by Mr. F. Perske, in a field of 1900 Seedling, has made good growth, outstripping the Mauritius variety, notwithstanding they were both planted at the same time in the autumn of 1920.

Cane pests are not troubling the growers much, although large numbers of beetles have been observed flying at different periods during November and December. In the case of possible grub attack in the late autumn, the growers have been recommended to use arsenic.

A short visit was paid to Booyal. Very little cane is grown there now, the farmers following other pursuits. The soil, however, is good; and, with the exception that light frosts occur now and again, the district is suitable for cane-growing. Varieties that have been introduced to Booyal include Badila, Goru, D.1135, Rappoe, Black Innes, Mahona, H.Q. 426, Cheribon, Striped Singapore. Of these, Rappoe, Striped Singapore, and D.1135 did about the best. Heavy tonnages have been obtained at Booyal, and could be again grown if farmers took planting up again seriously.

Dallarnil was also gone over. A little cane is at present being grown, though more is now being planted. D.1135 is the principal variety, the farmers being satisfied that this is the best cane for the Dallarnil district. A drawback here is the distance from the mill.

PIALBA.—Judging by the general appearance of the cane, the harvest should be the best that has occurred for some years. Much of the ratoon cane is backward, but the plant crop looks well and should give a good return.

With regard to most of the cane that has been ratooned around Pialba, it would be as well, after the cutting, if the farmers were to plough out the old stools and give the soil a green manure crop before replanting; also, if possible, the soil should be limed. If measures are not soon taken, much of the land will not be worth planting.

A shortage of organic matter and, on acid soil, reaction are noticeable on many of the Pialba soils. The latter is sometimes due to bad drainage. The bulk of the spring water is charged with magnesia. Good rains have fallen at Pialba during this year, and live stock look well. Generally speaking, there is nothing outstanding to remark upon since last visiting Pialba. D.1135 is the staple variety. This cane is now showing considerable signs of deterioration, and requires careful selection and planting.

MARYBOROUGH.—This district has been benefited greatly by the recent rains and subsequent good growing weather. The plant cane is making rapid growth, and farmers who are still making a livelihood out of sugar production are looking forward to a fair harvest.

Of the many varieties that are growing in this district, which is one of the oldest in Queensland, D. 1135, 1900 Seedling, Rappoe, and Striped Singapore look about the best. The two latter canes are in some cases especially vigorous. They should be kept under observation for gumming, however. Green manuring, liming, and thorough cultivation would ensure more profitable returns on many of the farms in this area.

Tinana Creek and the Mary River are fine waterways. They are availed of to a certain extent by the cane-growers for transport to the mill. This method is cheap and effective, and better facilities for carrying out this work would bring about greater efficiency and more comfort for all concerned.

Yerra.—Although, with one or two exceptions, the areas planted here are very small, the farmers seem more encouraged to produce than they have done for a long time. The cane looks healthy, and tonnage returns per acre should be well up to the average of other districts. Some farmers have done a fair amount of clearing, either for the purpose of introducing grasses or cane-growing. Mr. N. Jacobsen has been doing something in this respect recently, and is now busy planting with the mattock. The land cleared was covered with dense scrub, and is a light porous loam, with a clayey loam subsoil. The variety to be planted is principally Q. 813. The chief drawback the farmers on the low-lying portions have to contend with is the likelihood of frosts. These occur between May and September, if they do strike the district at all. As remarked in previous reports on Yerra, the roads leave something to be desired, but still there has been a considerable improvement lately.

RUBBER.

The "Journal of the Jamaica Agricultural Society" writes:—

The future prosperity of rubber is obviously entirely a question of the relation between supply and demand.

During the last five years, the production and consumption of rubber have kept pace, both increasing at the rate of 50,000 tons per annum; but the forecast is that no such increase of rubber can be expected after this year.

During the war large stocks accumulated at the places of production, for want of freight to transport the rubber to the markets. Yet practically all these stocks have been already absorbed in addition to the 1919 output.

The output from the world's rubber trees of Amazon Valley has been largely decreased owing to the impossibility of marketing the rubber during the war, and the industry there is disorganised. But, of course, the trees are there; and whether this trade will ever resume its former importance depends upon the price, which would require to be high now to pay the very largely increased expense of gathering.

Then, again, the revolutionary wars in Mexico have destroyed many of the large plantations of Castilloa rubber there, and work on practically all has been stopped for half a dozen years. Meanwhile, the plantations in the East are highly organised and go on paying large dividends.

It seems that if the consumption of rubber goes on increasing as it is steadily doing, largely owing to motor transport, there will be a rubber shortage in the near future.

There were great hopes in Germany once of their chemists producing a synthetic or artificial rubber which would largely replace natural rubber. This hope is not now held. The Germans planted largely of rubber in their West and East African Colonies, more especially in the Cameroons, and they interplanted it with cocoa trees where conditions suited both. Sometimes they interplanted oil palm too; but this was overdoing it, and the cocoa did not stand two shade trees. But, as a rule, the cocoa and rubber have done well together. The rubber of West Africa is mostly Funtumia, native to West Africa, but there is also Hevea.

Whoever has rubber trees here should hold on to them. The latex is cumulative; that is, the ability of the tree to produce more and more increases with age, and some day many of the trees here will be tapped to great advantage if a big demand at a high price suddenly occurs, and will probably produce £2 or £3 value each, which, if it happens at a time when other products are low, will come as a boon to many. History repeats itself. Records show that there have been times here when estate-owners have chopped down cocoanut trees because of the low price of the nuts, and planted bananas; have chopped out large bearing cocoa trees in the same way, only to replant a few years later when the price of bananas was low over a few years. We remember when logwood trees were advocated to be cut out, as there was little demand and they interfered with the growth of grass for cattle. How different now!

At present practically everything is subordinated to sugar-cane; and we fear that there may be such a craze that cocoanuts, cocoa, rubber—every tree that stands in the way of cane—may be chopped down. But hold on to mixed cultivation; the history of our products show that every one has its ups and downs. Plant cane by all means where land is free, and even sacrifice part of pasture and bananas, which are quickly established again if necessary; but it is a sacrilege to chop down a good economic tree for the sake of sugar-cane.

RUBBER FINANCE PROBLEM IN INDIA.

Speaking at a rubber company's annual meeting, Mr. R. F. McNair Scott made an interesting contribution to the discussion on the rubber position. In the course of his speech he remarked:—

"The rapid and unexpected fall in the price of rubber during the last few months has forced us to recast our ideas as to cultivation, equipment, &c.; and, both by mail and cable, instructions to exercise the utmost economy, compatible with the safeguarding of the estates, have gone out with increasing emphasis as the price of rubber fell to, and then below, the cost of production. This fall is admittedly largely due to America's present inability to use rubber contracted for ahead. It is difficult to believe that the great American manufacturing organisations, who are now reselling rubber at less than half the price at which they were eager buyers a few months ago, can have completely misjudged consumption in its broad aspects; their and our troubles seem rather caused by a temporary dislocation in finance. The general malaise due to crushing taxation and disturbed exchanges found the rubber industry more vulnerable than most, as it is still in process of organisation to deal with a rapidly increasing mass of rubber, now some ten times the world's production of less than twenty years ago.

"Speaking broadly, we, the producers, finance rubber during its growth and transport to market—a period of years. The manufacturers have to finance the rubber during its manufacture and sale—a period of months. Between producer and manufacturer stands the dealer who has normally to finance for a period of days. If the financial arrangements of the manufacturer break down, whether this breakdown be brought about or aggravated by his money being locked up in factories planned to meet an anticipated increase in consumption; or by planting up large areas of rubber —an activity which incidentally he might have left to us, the growers; or through general depression by the temporary failure of consumers to take up their requirements, its effect on the dealer, with a normally revolving finance of short duration, is profound.

"The remedy seems to be for us growers to increase for a time the period for which we have to finance rubber. Unfortunately, as individual companies, we have not yet (harried as most of us have been by the tax collectors) been enabled to build up our reserves sufficiently to do this. Hence, although admittedly the difficulties are great, concerted action seems essential if we are to obtain the necessary financial assistance from outside. Such concerted action can only find stability on the tripod of cordial co-operation, reliable information, and adequate finance. The last would be forthcoming if growers provide the first two requisites. The obvious first step is to lessen the amount of the commodity to be financed, and this has been by a general agreement to reduce normal output by 25 per cent. But such agreement should be universal, and it may be desirable that the F.M.S. Government should take a hand in enforcing reduction. It is urgent that action should be prompt and decided, for so far you have nothing to persuade consumers that the turn has come. If their confidence were restored by the knowledge that reduction would be enforced, and, if necessary, increased, market conditions would change rapidly."—"The Planters' Chronicle," Madras.

SYNTHETIC RUBBER: ANOTHER FAILURE.

Germany during the war was practically without raw rubber, and it can be well understood that the urgent necessity for some substitute would command the attention of all the chemical science which that nation is known to possess. We have recently heard some remarkable stories about the invention of synthetic rubbers which would revolutionise the rubber trade. With the experience of so many similar projects in the past, we are always sceptical of the claims made by inventors of synthetic rubber, and we are not at all surprised to learn that at the annual meeting of Friedrich Bayer Farbenfabriken Co., it was stated that for the present all hopes which had been pinned to synthetic indiarubber had been abandoned, owing to the ever-increasing price of raw material required for its manufacture.

As already recorded, it is quite possible to make synthetic rubber which complies with the chemical analysis of the raw material, although the resulting material has never been satisfactorily proved to have the life of the natural article, while the cost of production of synthetic rubber has always so far been greatly in excess of Nature's product.

It is estimated that some 120 millions of British capital are invested in the plantation rubber industry. There are something like 3,000,000 acres under plantation rubber. The output of plantations last year was over 300,000 tons, and this year it is estimated to be some 360,000 tons. Compare this present rate of production with the output of 145 tons fifteen years ago!—"Journal of the Jamaica Agricultural Society."

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

By C. T. WHITE, F.L.S., Government Botanist.

No. 21.

GOOSEFOOT (Chenopodium triangulare, *R.Br.*)

Description.—A straggling herbaceous plant, leaves and stems light green, the older ones often reddish, the younger ones covered with a white meal. Leaves on a leaf stalk (petiole) as long as the blade; blade hastate or triangular usually under 1 in. long, and as broad or nearly as broad as long. Flowers very small, in distant clusters along terminal or short axillary spikes. Fruit (''seed'' in the popular sense) small (about ½ a line in diameter), black and slightly rough, perianth segments of the flower more or less persistent and appearing as five white raised lines on the lower half of the fruit; seed dark black.

Distribution.—A common weed in Southern Queensland and in New South Wales. It is not found outside of Australia.

Common Names.—''Goosefoot'' is an English name commonly applied to different species of Chenopodium. It also goes under the name of ''salt weed'' or ''salt herb'' —names applied to allied plants, principally to *Atriplex semibaccata*. Sometimes it is called ''fat hen''—a name, however, more often applied to taller growing plants of the genera *Chenopodium* and *Amarantus*.

Botanical Name.—Chenopodium from the Greek *chen, chenos*, a goose, and *pous, podos*, a foot, being simply a translation of the local name given on account of the shape of the leaf of many species; *triangulare*, Latin alluding to the triangular shape of the leaf blade.

Properties.—Some few years back specimens of this weed were forwarded by Mr. F. J. Watson, Dairy Inspector, Maryborough, as a plant eaten by dairy cows, tainting their milk and causing a ''fishy'' flavour in the butter subsequently made. Recently specimens were sent by Mr. A. R. Wilkin, Instructor in Cheesemaking, with the report that the plant grew profusely in parts of the Burnett district, and had the property of tainting the milk of cows consuming it.

Apart from this property the plant is evidently a valuable forage, as in March, 1919 (during the drought period), Mr. A. F. Kentish, of Tara, *viâ* Dalby, sent specimens taken from a two-year-old haystack, and stated that in the hay form his stock had been eating it in preference to other feed. A small sample of the hay was handed over to the Agricultural Chemist (Mr. J. C. Brünnich), who reported that the plant appeared to be a very valuable fodder, and gave the analysis as follows:—

Analysis.	Hay. Dry Material. Per cent.	Green Material. Per cent.
Moisture	8.29	50.00 (assumed)
Crude protein	16.62	9.06
True protein	10.25	5.59
Carbohydrates (by difference)	32.27	17.59
Fibre (crude)	22.63	12.34
Ether extract	2.19	1.19
Crude ash	18.00	9.81
Lime	1.18	0.64
Phosphoric acid	0.39	0.21
Nutritive ratio	5.1	5.1
Starch value	46.1	25.2
Starch equivalent	23.9	43.7
Protein equivalent	24.7	45.3

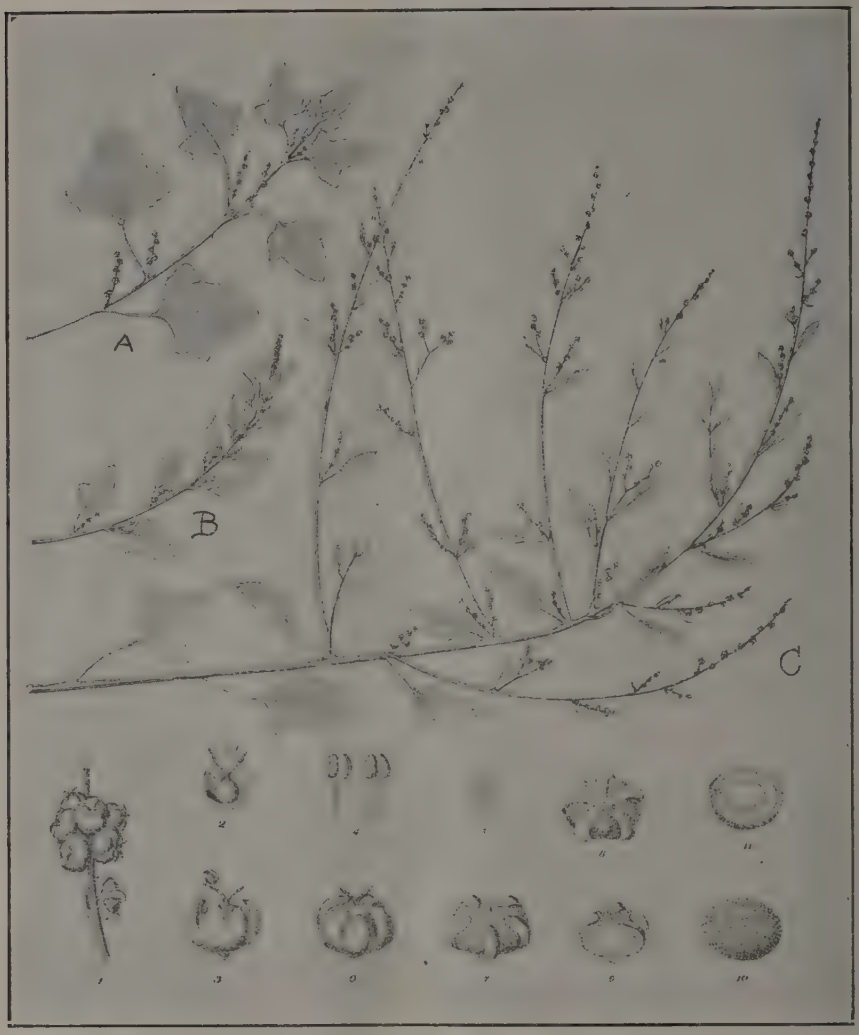


PLATE 19.—GOOSEFOOT (*Chenopodium triangulare*), R. Brown.

A, B, and C.—Shoots somewhat reduced.
1.—Portion of branchlet bearing flowers.
2.—A flower, part of the calyx removed.
3.—A flower.
4.—Back and front view of a stamen.
5.—Pollen grain.
6.—A young fruit.
7 and 8.—Mature fruits (seeds).
9.—Longitudinal section of a fruit.
10.—A seed.
11.—Transverse section of seed.
1-11.—Variously enlarged.

(After Mueller in "Iconography of Australian Salsolaceous Plants.")

Forestry.

QUEENSLAND TREES.*

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Government Botanist.

No. 1.

SCRUB IRONBARK (Bridelia exaltata).

Common Name.—Scrub Ironbark.

Derivation.—*Bridelia*, after Professor Bridel, an early worker on mosses; *exaltata*, Latin, lofty.

Description.—A tree attaining a height of about 100 ft. and a barrel diameter of about 2 ft. Barrel not prominently flanged. Bark dark brown in colour and prominently furrowed or fissured; when cut it is seen to be red internally, and measures about ½ in. in thickness on a tree with a barrel of 2 ft. diameter. Sapwood, white; heartwood, light brown. Leaf stalks, ⅛ to ¼ in. long. Leaves, alternate, narrowly egg-shaped in outline, narrowed at the apex, with prominent lateral nerves and net veins especially on the underside, upper face somewhat glossy, under surface paler and duller; measurement of leaf blade, 1½ to 2½ in. long, twice to three times as long as broad; the leaves on coppice ("sucker") shoots and young trees are often much larger. Flowers small, in small clusters of about 6 or less in the forks of the leaves or at the scars of fallen leaves. Fertile male and female organs in separate flowers; the two sorts of flowers often on the same tree and in the same cluster. Stalks of individual flowers one-twelfth of an inch or less in length. Individual flowers about a-quarter of an inch or less in diameter when expanded, consisting of 5 triangular calyx lobes, 5 small petals inserted between the calyx lobes and shorter than them; and in male flowers, 5 stamens about one-tenth of an inch long surrounding an abortive ovary; in female flowers an ovary, which generally develops into the fruit. Fruit, globular, yellow when fresh, turning brown, about one-third of an inch in diameter, with a fleshy outer coat surrounding a "stone," which is generally 2-celled, and when ripe contains one seed in each cell.

Flowering period (?); in fruit from March to June.

Distribution.—Confined to Australia. Coastal scrubs of Southern Queensland and Northern New South Wales. Our northermost locality record at present is the Gympie district. It is common in the remnants of "scrub" (rain forest) about Brisbane, in the Goodna scrubs, and in the drier "scrubs" of the Beaudesert and Canungra districts.

Uses.—R. T. Baker ("Hardwoods of Australia," page 356) states that the timber is not uncommon on the Sydney market, and that it is suitable for carriage and coach parts, shipbuilding, and general constructional work.

Notes.—The tree is very common in some localities as secondary undergrowth in paddocks and as the leaves, like those of young sorghum and some other well known plants, contain a prussic-acid yielding glucoside, they may, if eaten in quantity by stock, produce death, though no actual losses due to the plant have been recorded.

The ripe berries, which are generally produced in great abundance, are greedily sought after by fruit-eating birds.

References.—*Bridelia exaltata*, F. v. Mueller, in "Fragmenta Phytographiæ Australiæ," Vol. III. (862); Bentham, "Flora Australiensis," Vol. VI., page 119; F. M. Bailey, "Queensland Flora," Part V., page 1410; R. T. Baker, "Hardwoods of Australia," page 356, pl. 116, and fig. lxxviii. (The generic name is sometimes spelt *Briedelia*.)

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* Under this heading it is decided to give from month to month popular descriptions of some of our native trees. After a number have been published, it is hoped, should opportunity permit, to issue the matter along with illustrations and descriptions of other species in book form.

The descriptions are as void of pure technicalities as possible, and have been drawn up from fresh material or from specimens preserved in the herbarium collections of the Department.

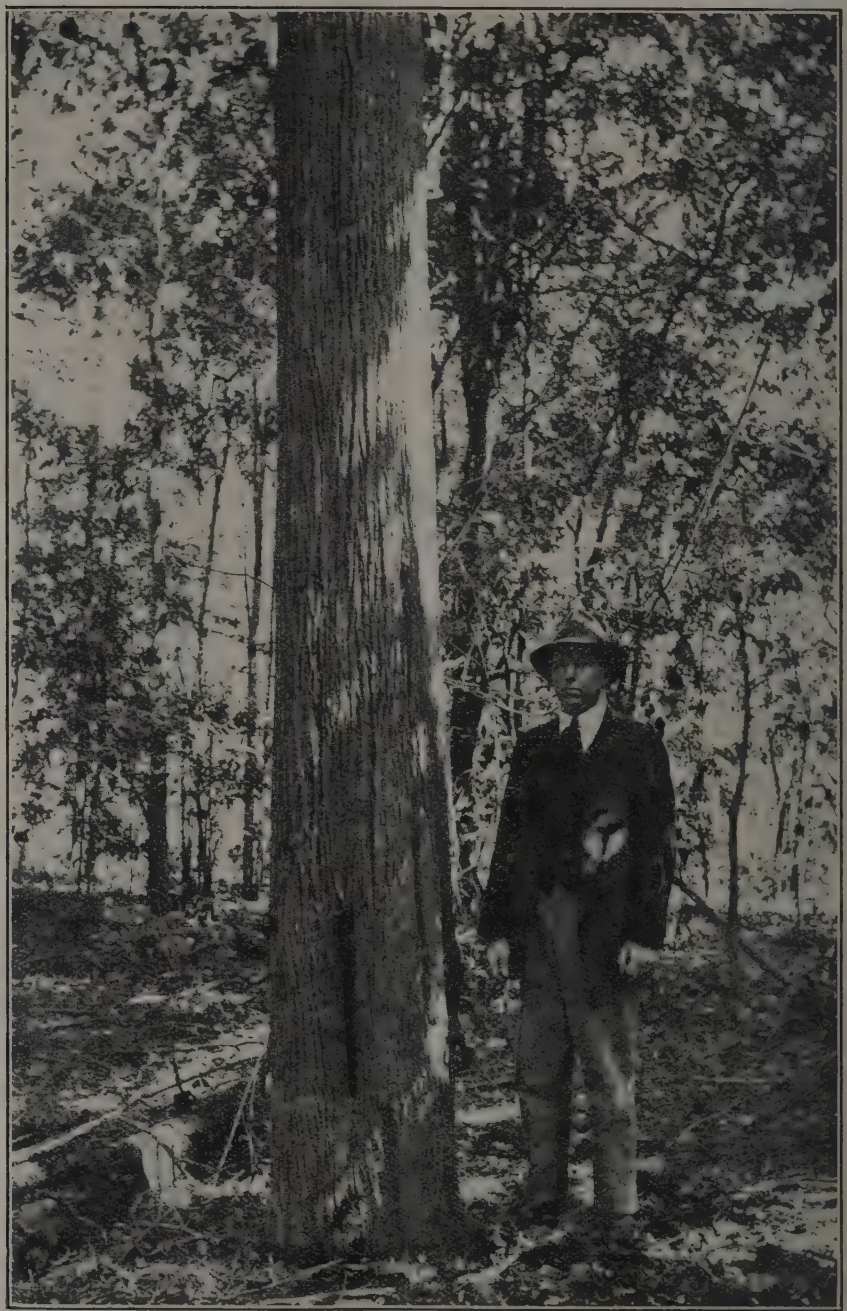


PLATE 20.—SCRUB IRONBARK (*Bridelia exaltata*), GOODNA SCRUB.

Plate 21.—Scrub Ironbark (*Bridelia exaltata*).

A.—Large leaf from young coppice growth.
B.—Fruiting twig.
C.—Flowering twig.

Science.

SEED ELECTRIFICATION.

Experiments that may be accepted as fairly conclusive have been carried out in Great Britain to test the effect of the electrification of seed.

This process consists in immersing the seeds in a solution of common salt and water (4 oz. to the gallon), or calcium chloride and water (8 oz. to the gallon), to which an electric current is then applied. The seeds are dried 100 degrees Fahr., and are then ready for sowing.

The tests were made with seeds of mangold, swede, cattle cabbage, and carrot; and two distinct series were arranged—a germination test and a field test.

The conclusions arrived at are:—

"*Germination.*—Notwithstanding the one or two points which seem to be slightly in favour of the electrified seed, the results obtained by this series of tests can only be regarded as inconclusive.

"*Field Test.*—The outdoor tests, as a whole, would appear to be no more conclusive than were the tests for germination, the returns from the electrified seed showing no advantage over the other sections, except to a small extent in the case of mangold.

"It will be seen that the results are of an inconclusive nature, and would not seem to justify the employment of the process.

"The failure of electrified seed to give any increase in yield under the carefully controlled conditions of an experimental station trial shows that the process lacks certainty. It cannot be compared in effectiveness with manuring, which succeeds nearly every time when properly done. The writer (Dr. Russell) is not prepared, on present evidence, to say that the process will succeed, but the risk of failure seems so great that the farmer should look upon it as an adventure which may or may not be profitable."—"New Zealand Farmer."

WHAT IS COBALT?

It was lately announced in the daily newspapers that a valuable outcrop of cobalt had been discovered near Cloncurry, and it was stated that the value of cobalt was higher than that of molybdenite during the great war. We have been asked by a correspondent to give some information concerning cobalt and its uses. Metallurgists tell us that cobalt is a metal, and is one of the only three metals which are attracted by the magnet, and can become magnets themselves—viz., iron, nickel, and cobalt; but they cannot retain their magnetism as does the compound metal "steel." The colour of cobalt is reddish grey; it is brittle and difficult of fusion. Generally, it occurs combined with arsenic, and associated with nickel and iron. Its oxides, on account of their brilliance and permanent colour, are of importance in the arts, such as in the manufacture of glass, to produce the beautiful blue varieties called "smalt." At times it is a substitute for nickel in plating goods, and as an enamel, and in pigments generally. The reported discovery at Cloncurry should be a valuable one.

HOME-MADE SHEEPSKIN RUG.

With the approach of winter come inquiries as to the preparation of fur and wool skins for mats and rugs. To prepare a sheepskin is not very difficult. Take a fresh skin, clear it of any dirt and wash the wool in slightly warm soap suds, to which you have added a tablespoonful of kerosine oil. Then wash in fresh suds until the wool looks white and clean. Put it in sufficient cold water to cover it and dissolve ½-lb. each of salt and alum in three pints of boiling water. Pour this over the skin side, and rinse it up and down. Let it soak in this for 12 hours, then hang up to drain. When nearly dry, tack it, wool side in, on the wall of the barn to dry. Now rub into the skin 1 oz. each of pulverised alum and saltpetre, or double this if the skin is large. Rub for an hour or two. Fold the skin sides together, and hang away for three days, rubbing every day, or till perfectly dry. Then, with a blunt knife, clear the skin of impurities, rub it with pumice, or rotten stone, trim into shape, and you have a warm rug which should last a life time.

General Notes.

TO TAN A HIDE FOR WHIP-MAKING.

To make a stock whip of kangaroo hide, the hide must be tanned; but if of calf or bullock hide, tanning is not necessary. To tan a skin, the general principle is to trim off the useless parts of the skin, and remove all fat from the inside. Then soak the skin in warm water for about an hour, after which apply a coating of borax, saltpetre, and Glauber's salts—1 oz. of each dissolved in sufficient water to make a thin paste. On the following day give a coating of a mixture of 1 oz. of sal. soda, ½ oz. of borax, and 2 oz. of hard soap. This mixture should be slightly heated without allowing it to boil. After this, fold the skin together and leave in a warm place for twenty-four hours. Then take 4 oz. alum, 8 oz. salt, and 2 oz. saleratus; dissolve in hot water, and when cool soak the skin in it for twelve hours. Wring out and hang up to dry. If the skin is not sufficiently soft after this, the soaking and drying must be repeated two or three times. Another method is to wash the skin in a solution of sal. soda and water. Then take 4 oz. powdered alum, 8 oz. salt, 1 quart new milk to 4 gallons salt water, and 1 pint prepared starch; stir well, then put in the skins, and air them often by hanging them over a stick laid across the tan tub. Handle them occasionally until they have been in the solution a day or two. Then remove the skins and add to the liquor a half teaspoonful of sulphuric acid. Stir this well in. Put the skins back, and steam them well for about an hour. Then wring out the skins in lukewarm water, and hang them up in a cool place. When they begin to get white, work and stretch them till dry. Hides of animals larger than kangaroos should remain longer in the solution.

When making a whip of calf-skin or bullock hide, use the hide green. Soak it well, shave off the hair and underside with a sharp knife, and stretch well after cutting into strips of the required size.

To Remove the Hair or Wool before Tanning.—First wash the skins thoroughly in water; then place them one above the other with the flesh side up. Then saturate each skin on the flesh side with a thick cream of lime, after which double them with the hairy side out. Let them remain thus for twenty-four hours, when the wool or hair should be loose; remove them and leave them to soak in weak lime and water. Remove them twice a day, and stir up the liquor before replacing them. Continue this treatment for three days, after which place them in a stronger lime liquor, and draw daily as before. In seven days, whatever hair has been left on should be easily removed. The next step is unhairing and fleshing—that is, the scarf skin and remaining hair are removed with a blunt knife, and all fat and flesh is taken off with a sharp one. Lastly, soak the skins well in some preparation of ammonia to convert the lime in the pores into soluble salts, which may then be removed by washing and scraping.

RATS EATING MATCHES A CAUSE OF FIRE.

Commenting on a paragraph in last issue of the Journal, Mr. Daniel Jones contributes the following interesting notes on this subject:—

"As bearing on the statement in your March issue *re* fires caused by rates, may I be allowed to tender my own experience on this question? Some years since, while engaged in fruit-growing not far from Brisbane, I had occasion one morning to open a drawer in my writing desk and, to my surprise, found much of the contents singed and some documents burned up. On closer search as to the then unexplained cause of the fire, I found a dead rat among my papers. As there were loose matches in the drawer, no other conclusion could be come to but that the rodent had squeezed itself into the closed drawer and, in the act of eating matches, ignited some and caused its own death.

"Previous to this, I had often regarded the possibility of rats causing fires with some doubt; but having direct evidence as in my own case, I am quite ready to credit some fires at any rate to the activity of rats or mice. Fortunately, the confined space in which the fire started, precluded further spread; hence, instead of having a conflagration involving loss my luck saved the situation."

FOOT-AND-MOUTH DISEASE.

INTRODUCTION FROM ABROAD.

The way by which foot-and-mouth disease is brought into Great Britain and similarly situated countries from time to time, notwithstanding the fact that into the former in particular the importation of susceptible live stock is prohibited, is as mysterious as it is interesting. The subject has given rise to spasmodic discussions, but the possibilities do not seem to have been methodically debated in relation to the actual facts, so far as they are known.

It may be accepted as established that Great Britain freed from the disease in enzootic form is only invaded when the disease is prevalent on the Continent, particularly when it prevails in the north of France, Belgium, and Holland. In the light of recent experience, it would also appear that the greater the prevalence, the more frequent are the invasions.

Live stock being excluded as a factor, it is not unnatural that suspicion should have fallen upon human beings coming from the Continent where the disease is raging, and on imported feeding stuffs and litter. It may be mentioned, however, to save further discussion, that the importation of hay and straw, except for exceptional purposes, has been prohibited since 1908, and that the position as regards foot-and-mouth disease has not apparently been modified in consequence.

Whether Disease is Communicated by Feeding Stuffs, Packing Materials, and Human Beings.—These represent the communications between animals of the farm and the outside world, and it is not unnatural that they should have fallen under a sustained suspicion. The object of the inquiries which have been made over a period of years was to find whether any credible factor repeated itself in a number of outbreaks, or whether any lines of evidence from a series of initial outbreaks would converge on one point, for example, on a cargo or consignment of feeding stuffs, &c. It may be said at once that it has not been possible to establish anything of the kind. It is true grave suspicion has sometimes rested on a certain article, mainly on account of its advent synchronising with the appearance of disease on the premises, but in almost every case further inquiry has shown that the same consignment has been distributed to many other premises where no disease has occurred. It is also correct that an occasional outbreak arose near camps in which soldiers from the Continent had been concentrated. On the other hand no actual communication was established between the soldiers and the premises which became infected. Moreover, initial outbreaks had been known to occur in the past in the same locality when there were no soldiers or other persons to suspect, and in the vast majority of cases no outbreaks arose near camps of the kind.

The most that can be said of the above evidence is that it is not in favour of the view that infection is generally brought to this country by men and such articles as have been mentioned, but in addition there is the fact that many initial outbreaks have occurred on premises far removed from others, the animals of which having received only foodstuffs grown on the place, and the attendants not having been off the place for weeks before disease appeared. The weightiest evidence, however, against men, foodstuffs, &c., being responsible for the importation of initial infection has arisen in the last year or so, during which the invasions have been exceptionally frequent. It will be shown later that invasions have repeated themselves during the last twenty years in more or less defined areas of the country, though not on the same premises, large parts of England and Wales, and the whole of Scotland and Ireland having escaped entirely or almost so (there has been one initial outbreak in Scotland, at Edinburgh, in the last twenty years). These immune areas receive the same class of foodstuffs, &c., and are visited by the same class of human beings, and it is almost inconceivable that over a period of twenty years certain areas could receive all the infected persons and things which came into the country, and others escape entirely, if persons and foodstuffs are generally responsible for the importation of infection. This is all the more remarkable when it is remembered that in over 80 per cent. of the outbreaks of anthrax, infection is conclusively shown to arise from imported feeding stuffs and manures, and that the outbreaks follow the lines of distribution, sparing no parts of the part of the country in which they are used, Scotland for example, being as heavily hit in proportion as England.

If, then, the usual communications between the animals of the farm and the outer world do not account for the conveyance of something—virus of foot-and-mouth disease in this case—which arrives on farms with a certain amount of frequency, other possible methods of communication must be considered, even if they appear at first sight fanciful.

Air-borne Virus.—No support having been found for the ordinary methods of conveyance of virus, it seems justifiable to explore the possibility of the virus being air-borne for long distances, either by air currents or birds, or otherwise. As regards

air currents, when affected cattle are allowed to remain alive on open pastures or at work, as is customary on the Continent for example, it is no uncommon thing to see strings of viscous slobber from the mouth whirled up into the air and dispersed into minute parts which disappear from sight. This material is known to be infective in infinitesimal doses, and it can therefore stand a high dilution. What becomes of it after it gets into the air is obviously a question which cannot be answered definitely. It is a fact, however, that even in this country where the official method of handling diseased animals—housing and almost immediate slaughter—gives few opportunities for virus to spread, ramifications in the direction of a strong prevailing wind have been occasionally observed to a distance of a few miles, and no ordinary communication could be traced by the minutest inquiry. Having regard to the distance which volcanic dust can be borne in the air it seems reasonable to believe that very small particles of infected mucus could be carried long distances by air currents, even in clouds, and be washed down in rain. The experiments of Blackley which showed that the air may be heavily charged with grass pollen, and that it might be carried thus as far as from Norway to this country, are of some interest, and it may be remarked that pollen from pastures in infected countries might be contaminated.

Accepting air-borne virus as possible, the next question which arises is, whether there exists more frequently anything in the form of air pockets of negative pressure in the areas mostly invaded, which could account for the suspended virus descending to earth or water. These are problems which obviously should be discussed with those who are now exploring the air. As regards birds, it immediately suggests itself that if birds in general are responsible, there should be definite periods of invasion, given prevalence of disease in other countries, which synchronise with those of the migration of birds inwards. There are two migratory seasons, during both of which birds arrive in or leave this country. In the autumn certain birds leave to winter elsewhere. These can be disregarded as importers. Others arrive to winter in this country. These can probably be disregarded, as most of them come from the North where the disease seldom prevails. In the Spring months birds come in mainly from the South for breeding purposes, and might be carriers whilst others depart for the North.

In going back over the outbreaks in the period of twenty years, however, it appears that the lowest records of invasion are March—4, April—1, May—0; July, in which there is no migration, shows 8. September, October, and November, when birds may be expected from the north and north-east, which are not the lands of prevalence as regards foot-and-mouth disease, show respectively 7, 7, and 4, while December, during which there is practically no migration inwards, shows 9.

These data are against the suggestion that there is any general relation between migration and invasion by foot-and-mouth disease. They do not, however, exclude the agency of those birds, such as ducks, geese, and gulls, which may, outside the migratory seasons, travel long distances for food. For purposes of closer investigation it might be assumed:—(*a*) that such birds might in their travels frequent contaminated pastures or drinking places and afterwards deposit virus in this country from their feet or plumage; (*b*) that they might swallow infected material, such as water and food contaminated by slobber and pieces of membrane from the mouths of cattle, and afterwards excrete the virus in a still active state. It is hoped that experiments which are to be conducted on the viability of the virus may determine the possibilities as regards (*a*) and that as regards (*b*) feeding experiments with the virus, using birds, may at least show whether the virus can pass through their intestines unchanged, and render their excretions infective for lengthy periods.

As the matter stands at present, however, the evidence, such as it is, is most in favour of particles of virus being carried by the air.

A NEW VARIETY OF CORN.

By the process of hybridisation (writes the "Queensland Times" of 18th March), Mr. A. W. Morris, teacher at Tipperary Public School, Young (N.S.W.), has produced a variety of maize which he believes will go a long way towards solving the problem of maize growing in comparatively dry districts such as Young (says the "Chronicle"). It will also be of value in districts like the coast, because it ripens as early as the Ninety Day, but has the advantage of giving a much better yield. First of all, Mr. Morris crossed Early Dent with Silvermine, and then the result of that cross with Ninety Day. In this way he produced a variety which has a small stalk like the Ninety Day, but cobs fully 1 ft. long and grain ½ in. deep. The cobs are thin, thus having more room for grain, and the grain is very closely packed. This corn was sown on 14th October and harvested on the 14th of last month; so that it had practically no rain during the whole period. Mr. Morris had about a quarter of an acre of it this season.

THE TOBACCO-GROWING INDUSTRY.

Since the departure of the late W. Neville in 1913, who for some time supervised the cultivation of tobacco at Texas (Q.), Bowen, and Cardwell, and the preparation of the crops for market, the industry languished, and for the past few years the area under this crop has much diminished. The drop in that time has been from 731 acres to 321 acres in 1919. At Bowen the tobacco industry is mostly in the hands of Chinese, and the decline there has not been so marked as at Texas. For this year, however, the area under tobacco at Texas has been largely increased, and it is anticipated that the season's crop will yield fully 100 tons, the rains having been very beneficial to the plants. The main difficulty in overcoming the hesitation of Europeans to cultivate this crop appears to lie in the close attention needed during the growing season and in the curing.

JOURNAL OF SCIENCE AND INDUSTRY, MELBOURNE.

We much regret to learn that it has been decided by the Executive Committee to suspend publication of the Official Journal of the Commonwealth Institute of Science and Industry. We have read with much pleasure and profit the several well-written scientific articles appearing in it monthly, some of them having been republished in the "Queensland Agricultural Journal." We note that the suspension of its publication is preliminary to an expansion of the work of the Institute, when a Director will be appointed, pending which the interim reports of various committees of inquiry will be communicated to the daily and technical press of Australia, and, when necessary, special statements will be prepared and circulated among persons particularly interested in the work in hand.

HOW TO KEEP LEMON JUICE FRESH.

Lemon juice may be bottled and kept indefinitely if it is strained into small bottles that have been sterilised and allowed to become perfectly dry. Fill nearly full with juice, put a teaspoonful of olive oil on the top, and cork tightly. Keep in a cool dark place. When ready to use, run a piece of clean cotton into the bottle to absorb the oil. The juice will be found to be as fresh as if it had just been pressed from the lemon.—"Garden and Field."

POULTRY AND EGGS DURING EASTER.

According to reports in the daily Press, it is anticipated that there will be a fall in the price of poultry, and an advance in the price of eggs with the advent of the Easter holidays. Towards the middle of March reports from various country centres indicated that large numbers of poultry would be on the market in the near future. There is already a limited demand for turkeys, but prices will in all probability advance for these. Some agents consider it would be advisable for poultry-breeders to take advantage of a bare market and sell while prices are good.

SOCIETIES, SHOW DATES, ETC.

BORDOREN.—Bororen and Miriam Vale Agricultural and Pastoral Society. Secretary, James Crawford. Show dates: 14th and 25th May, 1921.

INGHAM.—The show dates of the Herbert River Pastoral and Agricultural Association have been altered to 26th and 27th August, 1921.

GOONDIWINDI.—MacIntyre Pastoral and Agricultural Association. Secretary, J. S. Hall. Show dates: 26th to 28th April, 1921.

UBOBO.—Ubobo Farmers' Progress Association.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MARCH, 1921.

Article.		MARCH. Prices.
Bacon	lb.	1s. 4½d.
Barley	bush.	...
Bran	ton	£10 10s.
Broom Millet	"	£25 to £29
Broom Millet (Sydney)	"	£20 to £40
Butter (First Grade)	cwt.	238s.
Chaff, Lucerne	ton	£10 15s. to £11
Chaff, Mixed	"	£8 to £8 5s.
Chaff, Oaten (Imported)	"	£8 to £9
Chaff, Oaten (Local)	"	£6 to £7
Chaff, Panicum	"	...
Chaff, Wheaten	"	£6 to £7
Cheese	lb.	1s. 2d. to 1s. 3d.
Flour	ton	£19 17s. 6d,
Hams	lb.	1s. 8d. to 2s.
Hay, Lucerne	ton	£7 to £8
Hay, Oaten	"	...
Honey	lb.	4d. to 4½d.
Maize	bush.	4s. 8d. to 4s. 11d.
Oats	"	3s. 6d.
Onions	ton	£4 to £8
Peanuts	lb.	5d. to 6d.
Pollard	ton	£10 10s.
Potatoes (English)	"	£3 to £9
Potatoes (Sweet)	"	2s. 6d. to 5s.
Pumpkins (Cattle)	"	£5 to £6
Eggs	doz.	1s. 1d. to 2s. 9½d.
Fowls	per pair	3s. 6d. to 9s.
Ducks, English	"	5s. 6d. to 6s.
Ducks, Muscovy	"	6s. 6d. to 9s.
Geese	"	9s. to 11s.
Turkeys (Hens)	"	12s. to 15s.
Turkeys (Gobblers)	"	25s. to 40s.
Wheat	bush.	6s. to 7s. 8d.

VEGETABLES—TURBOT STREET MARKETS.

Asparagus, per dozen bundles	...
Beans, per sugar bag	2s. 6d. to 4s.
Beetroot, per dozen bunches	...
Cabbages, per dozen	4s. 6d. to 8s. 6d.
Carrots, per dozen bunches	1s. to 2s.
Cucumbers, per dozen	3d. to 1s. 6d.
Lettuce, per dozen	...
Marrows, per dozen	1s. 6d. to 3s. 6d.
Peas, per sugar bag	8s. to 14s.
Pumpkins (table), per doz.	2s. 6d. to 6s.
Rhubarb, per bundle	...
Sweet Potatoes, per sugar bag	1s. 6d. to 2s. 6d.
Tomatoes, per quarter case	2s. 3d. to 3s. 6d.
Tomatoes (inferior), per quarter case	...

SOUTHERN FRUIT MARKETS.

Article.	MARCH. Prices.
Bananas (Tweed River), per double case	7s. to 28s.
Bananas (Queensland), per double case	10s. to 23s.
Lemons, per bushel case	10s. to 14s.
Mandarins, per case	...
Oranges, per bushel case	10s. to 15s. 6d.
Oranges (Navel), per bushel case	...
Passion Fruit, per half bushel case	10s. to 11s.
Peaches	2s. 6d. to 6s.
Pineapples (Queens), per double case	6s. to 18s.
Pineapples (common), per double case	5s. to 7s.
Pineapples (Ripleys), per double case	5s. to 7s.
Quinces, per bushel case	3s. to 4s.
Tomatoes, per case	5s. to 7s. 6d.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per case	5s. to 6s.
Apples, Cooking, per case	3s. 6d. to 6s.
Bananas (Cavendish), per dozen	3d. to 6½d.
Bananas (Sugar), per dozen	5d. to 7d.
Bananas (Lady's Finger), second quality, per dozen	...
Citrons, per cwt.	8s. to 9s.
Cocoanuts, per sack	£1 5s.
Grapes, per case	5s. 6d. to 10s.
Lemons (Lisbon), per quarter case	4s. to 5s. 6d.
Mangoes, per bushel case	...
Oranges, per case	...
Papaw Apples, per tray	3s. 6d. to 7s. 6d.
Passion Fruit, per quarter case	7s. 5d. to 13s.
Pears, per half-bushel case	..
Peaches, per quarter case	1s. 6d. to 4s. 6d.
Persimmons, per quarter case	3s. 5d. to 5s. 6d.
Pineapples (Queens), per dozen	3s. 6d. to 5s.
Pineapples (Ripleys), per dozen	4s. 5d. to 7s.
Pineapples (common), per dozen	3s. 6d. to 6s.
Plums, per quarter case	5s. 6d. to 8s.
Quinces, per case	4s. 5d. to 7s.
Tomatoes, per quarter case	...

TOP PRICES, ENOGGERA YARDS, FEBRUARY, 1921.

Animal.	FEBRUARY. Prices.
Bullocks	£16 to £17 10s.
Bullocks (Single)	£20 5s.
Cows	£10 15s. to £11 2s. 6d.
Merino Wethers	26s.
Crossbred Wethers	27s. 6d.
Merino Ewes	20s. 6d.
Crossbred Ewes	27s. 9d.
Lambs	28s.
Pigs (Backfatters)	...
Pigs (Bacon)	...
Pigs (Porkers)	...

LONDON QUOTATIONS FOR TROPICAL PRODUCE.

Sisal hemp, per ton, £46. Rubber—Para, per lb., 11½d.; Plantation, per lb., 1s. 1⅜d. Copra, per ton, £33.

Farm and Garden Notes for May.

Field.—During this month, the principal work in the field will be the sowing of wheat, barley, oats, rye, and vetches. There is no time to lose now at this work. Potatoes should be hilled up. Cut tobacco. The bulk of the cotton crop should now be picked, the bushes being stripped daily after the dew has evaporated. Cotton-growers are notified that cotton-ginning and baling machinery has been installed on the premises of the Department of Agriculture and Stock in William street, where seed cotton will be received by the department from the growers, to whom an advance of 5½d. per lb. will be paid. The cotton will then be ginned, baled, and marketed in the best market, and whatever balance to credit is shown when account sales are received will be distributed amongst the suppliers according to the amount of cotton supplied by them. Only bare expenses of preparing the shipments and freight, if the cotton is exported, will be deducted. Thus it will be seen that cotton-growers will have a sure market for their produce. Every effort should be made to ensure feed for stock during the winter by utilising all kinds of green fodder in the form of silage or hay. Those who own dairy stock will be wise to lay down permanent grasses suitable to their particular district and soil. A few acres of artificial grass, notably Rhodes grass, will support a surprisingly large number of cattle or sheep in proportion to acreage. Couch grass in the West will carry ten to twelve sheep to the acre. Coffee-picking should now be in full swing, and the berries should be pulped as they are picked. Strawberries may be transplanted. The best varieties are Pink's Prolific, Aurie, Marguerite, Annetta, Phenomenal, Hautbois, and Trollope's Victoria. Aurie and Marguerite are the earliest. In some localities, strawberry planting is finished in March, and the plants bear their first fruits in August. In others, fruit may be gathered in July, and the picking does not end until January.

Kitchen Garden.—Onions which have been planted in seed beds may now be transplanted. The ground should long since have been thoroughly cleaned, pulverised, and should be rolled previous to transplanting. Onions may still be sown in the open on clean ground. In favourable weather plant out cabbages, cauliflowers, lettuce, leeks, beetroot, endive, &c. Sowings may also be made of all these as well as of peas, broad beans, kohl-rabi, radishes, spinach, turnips, parsnips, and carrots. Dig and prepare beds for asparagus.

Flower Garden.—Planting and transplanting may be carried out simultaneously during this month in showery weather; the plants will thus be fully established before the early frosts set in. Camellias and gardenias may be safely transplanted; also such soft-wooded plants as verbenas, petunias, pentstemons, heliotrope, &c. Cut back and prune all trees and shrubs ready for digging. Dahlia roots should be taken up and placed in a shady situation out of doors. Plant bulbs such as anemones, ranunculus, snowflakes, freesias, ixias, watsonias, iris, narcissus, daffodils, &c. Tulips will not suit the Queensland climate, but hyacinths may be tried, although success is doubtful. All shades and screens may now be removed to enable the plants to get the full benefit of the air. Fork in the mulching, and keep the walks free from weeds. Clip hedges and edgings.

Orchard Notes for May.

THE SOUTHERN COAST DISTRICTS.

The advice given respecting the handling and marketing of citrus fruits in the last two numbers of this Journal applies with equal force to this and the following months. Do not think that you can give the fruit too much care and attention; it is not possible, as the better they are handled, graded, and packed the better they will carry, and the better the price they will realise.

Continue to pay careful attention to speeking, and fight the blue mould fungus everywhere. Don't let mouldy fruit lie about on the ground, hang on the trees, or be left in the packing-shed, but destroy it by burning. Keep a careful lookout for fruit fly, and sweat the fruit carefully before packing. If this be done, there will be little fear of the fruit going bad in transit or being condemned on its arrival at Southern markets. Where the orchard has not been already cleaned up, do so now, and get it in good order for winter. Surface working is all that is required, just sufficient to keep moisture in the soil, keep down undergrowth, and prevent the packing of the surface soil by trampling it down when gathering the fruit.

Keeping the orchard clean in this manner enables any fallen fruit to be easily seen and gathered, and it need hardly be stated, what has been mentioned many times before, that diseased fruit should on no account be allowed to lie about and rot on the ground, as this is one of the most frequent causes of the spreading of many fruit pests.

May is a good month to plant citrus trees, as if the ground is in good order they get established before the winter, and are ready to make a vigorous growth in spring.

Don't plant the trees, however, till the land is ready, as nothing is gained thereby, but very frequently the trees are seriously injured, as they only make a poor start, become stunted in their growth, and are soon overtaken by trees planted later, that are set out under more favourable conditions. The land must be thoroughly sweet, and in a good state of tilth—that is to say, deeply worked, and worked down fine. If this has been done, it will probably be moist enough for planting, but should there have been a dry spell, then, when the hole has been dug and the tree set therein, and the roots just covered with fine top soil, 4 to 8 gallons of water should be given to each tree, allowed to soak in, and then covered with dry soil to fill up the hole. In sound, free, sandy loams that are naturally scrub soils, holes may be dug and the trees planted before the whole of the ground is brought into a state of perfect tilth. It is, however, better to do the work prior to planting, as it can then be done in the most thorough manner; but if this is not found possible, then the sooner it is done after planting the better. If the land has been thoroughly prepared, there is no necessity to dig big holes, and in no case should the holes be dug deeper than the surrounding ground either is or is to be worked. The hole need only be big enough to allow the roots to be well spread out, and deep enough to set the tree at the same depth at which it stood when in the nursery. Plant worked trees 24 to 25 ft. apart each way, and seedlings at least 30 ft. apart each way.

Towards the end of the month cover pineapples when there is any danger of frost; dry blady grass or bush hay is the best covering. Keep the pines clean and well worked—first, to retain moisture; and, secondly, to prevent injury from frost—as a patch of weedy pines will get badly frosted when a clean patch alongside will escape without any serious injury.

Slowly acting manures—such as meatworks manure when coarse, boiling-down refuse, farm manure, or composts—may be applied during the month, as they will become slowly available for the trees' use when the spring growth takes place; but quickly-acting manures should not be applied now.

THE TROPICAL COAST DISTRICTS.

May is a somewhat slack month for fruit—pines, papaws, and granadillas are not in full fruit, the autumn crop of citrus fruit is over, and the spring crop only half-grown. Watch the young citrus fruit for Maori, and when it makes its appearance spray with the sulphide of soda wash. Keep the orchard clean, as from now till the early summer there will not be much rain, and if the orchard is allowed to run wild—viz., unworked and dirty—it is very apt to dry out, and both the trees and fruit will suffer in consequence.

Bananas should be kept well worked for this reason, and, though the fly should be slackening off, every care must still be taken to prevent any infested fruit being sent to the Southern markets.

Citrus fruits can be planted during the month, the remarks *re* this under the heading of the Southern Coast Districts being aqually applicable here.

THE SOUTHERN AND CENTRAL TABLELANDS.

Get land ready for the planting of new deciduous orchards, as although there is no necessity to plant so early, it is always well to have the land in order, so as to be ready to plant at any time that the weather is suitable. The pruning of deciduous trees can commence towards the end of the month in the Stanthorpe district, and be continued during June and July. It is too early for pruning elsewhere, and too early for grapes, as a general rule. Keep the orchard clean, particularly in the drier parts. In the Stanthorpe district the growing of a crop of blue or grey field peas, or a crop of vetches between the trees in the older orchards, is recommended as a green manure. The crop to be grown as a green manure should have the soil well prepared before planting, and should be manured with not less than 4 cwt. of phosphatic manure, such as Thomas phosphate, or fine bonedust, per acre. The crop to be ploughed in when in the flowering stage. The granitic soils are naturally deficient in organic matter and nitrogen, as well as phosphoric acid, and this ploughing in of a green crop that has been manured with a phosphatic manure will have a marked effect on the soil.

Lemons will be ready for gathering in the Roma, Barcaldine, and other districts. They should be cut from the trees, sweated, and cured down, when they will keep for months, and be equal in quality to the imported Italian or Californian fruit. If allowed to remain on the trees, the fruit becomes over-large and coarse, and is only of value for peel. Only the finest fruit should be cured; the larger fruit, where the skin is thicker, is even better for peel, especially if the skin is bright and free from blemish; scaly fruit, scabby, warty, or otherwise unsightly fruit is not suitable for peel, and trees producing such require cleaning or working over with a better variety, possibly both.

The remarks *re* other citrus fruits and the work of the orchard generally, made when dealing with the coast districts, apply equally well here, especially as regards handling the crop and keeping down pests.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING FEBRUARY, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of Years' Records.	Feb., 1921.	Feb., 1920.		Feb.	No. of Years' Records.	Feb., 1921.	Feb., 1920.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	9·29	19	6·42	7·11	Nambour	8·66	24	3·93	5·05
Cairns	14·83	38	18·34	18·73	Nanango	4·45	38	0·86	0·60
Cardwell	16·87	48	10·34	9·60	Rockhampton ...	7·70	33	3·58	1·55
Cooktown	13·53	44	7·28	14·62	Woodford	9·11	33	1·34	1·73
Herberton	7·42	33	3·08	5·12					
Ingham	15·44	28	13·35	11·97					
Innisfail	19·64	39	20·29	13·81					
Mossman	14·84	12	14·25	18·95					
Townsville	11·98	49	1·38	4·00	*Darling Downs.*				
					Dalby	2·97	50	0·26	0·68
					Emu Vale	2·36	24	1·69	0·55
Central Coast.					Jimbour	2·98	32	0·14	0·73
					Miles	2·72	35	1·17	1·15
Ayr	9·20	33	0·99	4·16	Stanthorpe ...	3·38	47	1·97	1·57
Bowen	8·80	49	3·88	0·77	Toowoomba ...	4·44	48	1·71	0·70
Charters Towers ...	4·52	38	2·15	0·78	Warwick	3·01	33	1·71	0·80
Mackay	11·61	49	15·81	3·54					
Proserpine	10·75	17	15·25	3·07					
St. Lawrence ...	8·11	49	4·86	2·15	*Maranoa.*				
					Roma	3·11	46	0·36	4·08
South Coast.									
					State Farms, &c.				
Biggenden	3·84	21	1·29	0·73					
Bundaberg	6·34	37	0·72	0·32	Bungeworgorai ...	2·95	6	0·53	3·30
Brisbane	6·33	70	1·07	1·04	Gatton College ...	3·05	21	1·07	0·18
Childers	6·19	25	0·62	0·55	Gindie	2·88	21	0·44	0·73
Crohamhurst ...	15·03	25	3·82	3·85	Hermitage ...	2·52	14	1·50	0·80
Esk	5·66	33	0·42	0·79	Kairi	6·47	6	Nil	8·10
Gayndah	4·23	49	0·88	0·25	Sugar Experiment Station, Mackay	10·27	23	16·41	3·06
Gympie	6·68	50	2·59	1·85	Warren	4·86	6	0·93	1·40
Glasshouse M'tains	8·90	12	2·16	2·56					
Kilkivan	5·13	41	2·04	0·18					
Maryborough ...	6·60	49	2·00	1·22					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for February, 1921, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.
AT BRISBANE.

1921.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·22	6·42	5·41	6·20	5·58	5·46
2	4·58	6·45	5·22	6·41	5·41	6·19	5·58	5·45
3	4·59	6·45	5·23	6·41	5·42	6·18	5·59	5·44
4	4·59	6·46	5·24	6·40	5·43	6·17	5·59	5·43
5	5·0	6·46	5·24	6·40	5·43	6·16	6·0	5·42
6	5·1	6·46	5·25	6·39	5·44	6·15	6·0	5·41
7	5·2	6·47	5·26	6·38	5·45	6·14	6·1	5·40
8	5·2	6·47	5·27	6·38	5·45	6·13	6·1	5·39
9	5·3	6·47	5·27	6·37	5·46	6·12	6·2	5·38
10	5·4	6·47	5·28	6·36	5·46	6·10	6·2	5·37
11	5·5	6·47	5·29	6·36	5·47	6·9	6·3	5·35
12	5·5	6·47	5·30	6·35	5·47	6·8	6·3	5·34
13	5·6	6·47	5·30	6·34	5·48	6·7	6·4	5·33
14	5·7	6·47	5·31	6·33	5·48	6·6	6·4	5·32
15	5·8	6·47	5·32	6·33	5·49	6·5	6·5	5·31
16	5·9	6·47	5·32	6·32	5·49	6·4	6·5	5·30
17	5·9	6·47	5·33	6·31	5·50	6·3	6·6	5·30
18	5·10	6·47	5·34	6·30	5·50	6·2	6·6	5·29
19	5·11	6·47	5·34	6·30	5·51	6·1	6·7	5·28
20	5·12	6·46	5·35	6·29	5·51	6·0	6·7	5·27
21	5·12	6·46	5·36	6·28	5·52	5·59	6·8	5·26
22	5·13	6·46	5·36	6·27	5·52	5·58	6·8	5·25
23	5·14	6·45	5·37	6·26	5·53	5·57	6·9	5·24
24	5·15	6·45	5·38	6·25	5·53	5·56	6·9	5·23
25	5·15	6·45	5·38	6·24	5·54	5·55	6·10	5·22
26	5·16	6·44	5·39	6·23	5·54	5·53	6·10	5·21
27	5·17	6·44	5·40	6·22	5·55	5·52	6·11	5·20
28	5·18	6·44	5·40	6·21	5·55	5·51	6·11	5·20
29	5·19	6·43	...	...	5·56	5·50	6·12	5·19
30	5·20	6·43	...	...	5·56	5·49	6·12	5·18
31	5·21	6·43	...	...	5·57	5·48	...	...

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland, New South Wales, and Victoria, where the clock time is identical).

			H.	M.	
9 Jan.	●	New Moon	3	27	p.m.
17 „	☾	First Quarter	4	31	p.m.
24 „	○	Full Moon	9	8	a.m.
31 „	☽	Last Quarter	6	2	a.m.

Apogee on 9th. Perigee on 23rd.

8 Feb.	●	New Moon	10	37	p.m.
16 „	☾	First Quarter	4	53	a.m.
22 „	○	Full Moon	7	33	p.m.

Apogee on 5th. Perigee on 21st.

1 Mar.	☽	Last Quarter	abt. m'night		
10 „	●	New Moon	4	9	a.m.
17 „	☾	First Quarter	1	49	p.m.
24 „	○	Full Moon	6	19	a.m.
31 „	☽	Last Quarter	7	13	p.m.

Apogee on 5th. Perigee 21st.

8 Apr.	●	New Moon	7	5	p.m.
15 „	☾	First Quarter	8	12	p.m.
22 „	○	Full Moon	5	50	p.m.
30 „	☽	Last Quarter	2	9	p.m.

Apogee on 2nd and 30th. Perigee on 17th at 3 p.m.

ECLIPSES.

An Annular Eclipse of the Sun visible in North of Scotland but not in Australia will occur on April 8th.

An Eclipse of the Moon will occur on April 22nd, when the Moon will rise totally eclipsed.

The Planets Venus, Mars, and Uranus will be remarkably close together apparently on January 9th, and will form a fine celestial picture with the Moon on the 13th.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

SOIL PREPARATION.

Experience has shown (we learn from Messrs. Wilcox and Smith's Farmers' Cyclopædia of Agriculture) that chicory is adapted to any good loam soil that will produce good root crops, and that it will thrive wherever the sugar beet or mangolds do well.

Land for chicory should be deeply ploughed in the Spring, be well harrowed, and worked down to pulverise all lumps and make it compact, and again harrowed just before the seed is sown to kill all germinating weed seed.

PLANTING.

The seed may be sown at any time in fine weather in the Spring, in rows 18 to 24 inches apart if horse cultivation is intended, and from 12 to 14 inches apart if the crop is cultivated by hand. From 1 to 1½ lb. of seed is required per acre, but for use as a green crop from 10 to 12 lb. of seed are usually sown. The seed should not be covered more than three-quarters of an inch deep, and not more than one-half inch in heavy or wet soils.

CULTIVATION.

After the plants are up, they will need frequent shallow cultivation with some of the light cultivators made especially for sugar beet, to kill the weeds and preserve the soil moisture. When the plants have attained the height of 2 or 3 inches, they should be thinned out to stand from 4 to 6 inches apart. Only one plant should be left in a place.

HARVESTING.

If chicory is grown for forage, a crop of leaves can be cut in the Autumn, and afterwards two or three crops per annum will be provided. It is best cut just when the flowering shoots are extended, and before they become woody and hard, or the field can be grazed at intervals instead. The plant usually lasts (as a forage plant) in a productive state for four or five years.

In harvesting the root crop, a beet loosener may be run along the rows. This breaks the connection of the roots with the soil so that they can easily be lifted by hand. A less convenient way is to run a plough alongside the rows so as to expose the roots on one side. Special machinery has also been devised, and is procurable in the United States or in Europe (Holland, Belgium, Switzerland before the war), for pulling the roots. After removal from the ground, the tops are cut off at the base of the bottom set of leaves. The roots should not be pulled until they are ripe, and this stage is indicated by the disappearance of the milk from the roots.

If it is desired to keep the roots some time before delivery to a factory, they may be stored out of doors in piles from 4 to 5 feet wide at the bottom, and covered lightly with straw and earth. The ridges of the piles should be left open for a few days to let the warm air escape. The yield varies from 5 to 10 tons of fresh roots per acre.

PREPARATION OF THE ROOTS.

For the preparation of chicory, the older, stout, white roots are selected, and, after washing, they are sliced up and dried in a kiln. In our hot summer, however, the drying can be performed by spreading the sliced roots on a canvas framework, covering them at night to protect them from dew. In two or three days they are dry enough to bag. There are several varieties of chicory, but the sorts generally used for mixing with coffee are Magdeburg, Brunswick, and Elite, the last-mentioned variety being similar to the large-rooted Brussels or "White Loof" variety. The latter has a thick stubby root, and is the most profitable to grow for manufacture.

MARKETING.

The chicory grower can either sell the dried, sliced roots or he may roast them in a revolving iron cylinder. The loss in weight by this process is from 20 to 30 per cent. During the roasting 2 lb. of lard should be added to every cwt. of chicory to give it a lustre like that of coffee. The ground chicory looks like ground coffee, and smells like liquorice. There is a good market for it both in Brisbane and the Southern States, and now that the devastation caused by the war has practically put an end to the cultivation of many crops, such as beetroots, chicory, flax, and others—in Belgium and France—it would seem that there is a good opportunity for Queensland farmers to enter upon chicory cultivation and afterwards retain a business which cannot but be profitable.

Before the above calamitous war overtook France and Belgium, the price of Belgian chicory was £7 5s. per ton f.o.b. Antwerp; to-day Dutch chicory f.o.b. Dutch ports is quoted at £16 per ton for the dried roots. The wholesale price to retailers

of manufactured (*i.e.*, roasted and ground) chicory was £27 per ton, whilst now it is £45, and the price still rising. Here is a good opening for Queensland farmers to seize upon this industry and hold it for the future.

As to the prices for the dried root, Messrs. Harper and Co. are purchasers of good samples of dried and cured chicory roots at prices which should enable the grower to make a good profit on his crop. The seed may be obtained in Brisbane, and we understand that the price is 3s. per lb.

TREATMENT OF ALGAROBA SEED.

Some twenty years ago we published articles dealing with the Algaroba or Mesquit Bean as a fodder for stock. In April, 1900 and 1901, there were two articles on the value of the pods for this purpose, and full descriptions of the tree, its uses, and method of cultivation, written by Mr. G. B. Brooks, Instructor in Agriculture in the Rockhampton District, and at the time mentioned manager of the State Nursery, Kamerunga, near Cairns. *Inter alia* he wrote that, as in many localities in the Northern and Central districts stock has to depend almost entirely on the withered herbage as a means of existence, it would be a good thing of much interest to stockowners if something would come along to supply the necessary feed, something that would cost little or nothing by way of cultivation, and which could lay claim to a little attention from the large stockowner to the small selector.

In this respect he found the algaroba bean worthy of consideration, for, both from personal observation and information gathered from various sources, he found that the tree possesses qualities to draw it from its obscurity here in Queensland, and to give it a place among those plants having a high economic value.

Not only is it a tree that will thrive and flourish in circumstances such as described above, but it gives large crops of beans, valuable as stock feed, with a high fattening value, and, moreover, remains in bearing for some considerable time.

Another point in its favour is that it drops its pods as soon as ripe, thus doing away with any labour or expense in picking or feeding by hand. The tree of which Mr. Brooks wrote is the *Prosopis juliflora*, which grows to a height of from 30 to 40 ft. The pods are flat and from 5 to 8 in. long, and many bushels are obtained from a tree. It begins to ripen its pods at the end of November, and still continues bearing them after February and March. The timber is also very durable, and takes a polish like mahogany.

Some difficulty has been experienced by intending growers in raising seedlings, and disappointment has caused several to give up the idea of raising trees. However, the "Hawaiian Forester" (January, 1921) sets the difficulty on one side, stating that the results of a test, conducted earlier in the year, on the germination of seed of the algaroba or mesquit (*Prosopis juliflora*) when given different treatment before sowing were written up and printed in a special article which appeared in the December, 1920, "Hawaiian Forester and Agriculturist." A summary of the results obtained by the test is as follows:—

1. Algaroba seed is prepared for quick germination on passing through the alimentary system of a horse only when the seed is removed from the tough parchment-like covering.

2. Naked algaroba seed, untreated in any manner, gives the best germination results.

3. Placing the naked seed in boiling water and soaking it for 24 hours does not injure the seed, but greatly hastens germination.

4. The parchment-like seed covering greatly hinders germination.

RELATION OF LIME TO SOIL FERTILITY.

The following is the summary and conclusions of experiments conducted by Messrs. J. W. Paterson, B.Sc., Ph.D., and P. Scott, Chemist for Agriculture (Victoria), regarding the Relation of Lime to Soil Fertility:—

1. Lime tends to leave the surface soil through various channels, and fresh applications become necessary to maintain fertility.

2. Carbonate of lime is the best form of lime for the soil.

3. Burnt and slaked lime are rapidly changed to carbonate when they are applied to land.

4. The rate at which lime acts depends on its fineness of division.

5. Lime, but especially hot lime, has a good effect upon the mechanical condition of stiff clays.

6. Gypsum also coagulates clay, but it has not the beneficial action of lime in other directions.

7. Lime greatly hastens the production of nitrates.

8. It has a good effect in liberating potash and phosphoric acid, especially when the latter is combined with iron or alumina.

9. Where required by soil, lime produces larger crops.

10. It produces root crops, which are of greater feeding value.

11. It may often be a profitable application to grass land.

12. Lime kills sorrel, docks, and other acid-loving weeds.

13. It is specially stimulating to lucerne, clovers, and leguminous plants.

14. Lime will not act if phosphates are deficient.

15. It increases the need, everywhere present, of ploughing in green manure or stubbles.

16. It facilitates this operation.

17. The surest method of determining the need for lime is to dress trial strips and await results.

In an article on "Lime for Orchards," Mr. P. J. Carmody, Chief Orchard Supervisor, dealing in a practical manner with the effect of lime on fruit and fruit trees, and advocating its use, writes:—

"When it is considered that the average crop of fruit requires more plant food for its development than an average crop of wheat, and, moreover, that the fruit demands the same soil constituents year after year, the necessity for a sweet and favourable medium for root pasturage is apparent; and as no other application is at all comparable to the influence of lime for this purpose, its frequent use is urgently required. It is a matter of common observation that the fruit-buds of trees grown on sour soils are of a weak or indefinite character, while the bark is harsh and dry in appearance and the growth more or less stunted. Under such conditions it is practically impossible to develop trees on the most profitable lines without first correcting soil acidity by the free use of lime in the same manner as requires to be adopted for other farm crops.

"In many parts of the State insufficient attention has been given to this feature of soil management in the orchards. Particularly is this the case where fruit is grown on heavy clay soils. In these soils fruit trees grow through a lengthy period, so that a considerable quantity of immature wood is produced to the detriment of subsequent crops of fruit. Measures have not hitherto been adopted to definitely determine the actual effect of lime on the different parts of the tree; but investigations in other countries show that on soils rich in lime the wood is matured earlier and the fruit-buds are more stocky and robust than is the case with trees grown on soils deficient in lime. This is very apparent to anyone acquainted with the fruit areas of many parts of Gippsland and other places in Southern Victoria, and one is struck with the unusual prominence or length of the fruit-buds, the relative distance between the nodes, and the softness of the wood in these districts when compared with the same varieties grown in fruit centres known to possess lime in abundance."

It may not, however, be correct to assign these differences solely to the effect of lime, as other soil constituents bear an important part on the character of the tree and its fruit buds, particularly potash. It is generally recognised that the trees are not so manageable nor so prolific in bearing in soils where lime is deficient, and growers who have rectified this have had excellent results, though as artificial fertilisers were subsequently applied the same year, the relative value of the lime could not be ascertained. Though lime plays an important part in the apple and pear tree, it is in the stone fruits that its value is most apparent. It is a familiar fact that in soils rich in lime, stone fruit set their crops well, and are not so prone to cut off their fruit at the period of "stoning" as is otherwise the case. Where trees are making extensive wood growth with abundant foliage, there is but little doubt that the application of lime at the rate of 7 to 8 cwt. to the acre would be of pronounced benefit.

Seed Wheat for Disposal.

AT HERMITAGE STATE FARM.

This Department has been experimenting for a number of years with several varieties of wheat as a result of crossbreeding and selection work at Roma State Farm; some have consistently given satisfactory results, very often under adverse conditions. These are now being offered to wheatgrowers, in order that they may have the opportunity of acquiring seed of varieties which have been tested and found suitable to soil and climatic conditions in the wheatgrowing districts of the State.

Orders for the undermentioned varieties (which are illustrated and described elsewhere) should be directed to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Remittance must accompany order, and, in the case of cheques, should have exchange added.

The price quoted for any of the varieties offered is 11s. per bushel, f.o.b. Hermitage.

VARIETIES.—"Inglewood," "Patriot," "The Prince," "Gundi."
(*See* accompanying illustration of three of the varieties.)

In addition to the above a limited quantity of "Amby" is also available at the same price.

Inglewood.—Mid-season variety. This is derived from a cross between Bunge and Federation Wheat, and has given consistent results in the South-Western wheat areas. The plant is of medium height, and on strong soils is inclined to carry a fair amount of flag. It stools well and possesses a straw of medium strength. Heads are of medium length, slightly tapering; non-bearded. The chaff is smooth and light-brown in colour. Grain of medium size, somewhat elongated in appearance; semi-translucent.

Patriot.—Derived from a selection made after crossing Bunge and a Durum wheat. A mid-season variety, of moderate stooling habit. Straw is of medium height and somewhat tough. Flag scanty. Head tapering, non-bearded, open appearance, and of medium length. Chaff smooth and of a pale-golden colour. Grain somewhat short; full-bosomed; semi-translucent.

Plate 22.—Seed Wheat for Disposal.

The Prince.—A selected crossbred wheat; early mid-season variety, of fairly tall-growing habit, suitable for main-crop sowing. A good stooler, and carries very little flag. Head of medium length, open appearance, slightly tapering; non-bearded. Chaff smooth and of a pale-golden colour and somewhat closely attached to the grain, which is plump, full-bosomed, semi-translucent, and of medium hardness. Fairly resistant to rust.

Gundi.—A selection from a Bunge-Federation cross. A mid-season variety suitable for early sowing, of moderate stooling habit. It carries a medium amount of flag. Straw moderately stout and slightly under medium height. Head long and compact. Chaff smooth and light-brown in colour. Grain medium-sized; somewhat rough skinned; white in colour. This variety has given a yield of 37.2 bushels at Roma State Farm. More suited for Western and South-Western conditions than for the Downs.

Amby.—A popular variety suitable for main-crop sowing. It is a hardy mid-season variety and a good stooler, carrying a moderate amount of flag. Ears compact, non-bearded; chaff white and smooth. Grain plump and rather shotty in appearance; semi-translucent. Is an excellent milling wheat and has given good results in the principal wheat-growing districts.

AT STATE FARM, ROMA.

The following varieties of Seed Wheat are available for distribution from Roma State Farm. Price 11s. per bushel; free on trucks, Bungeworgorai:—

"Amby." **"Bunge No. 1."** **"Soutter's Early."**

Limited quantities of the following new wheats are also available at the same price:—

"Cedric." **"Inglewood."**

In the event of farmers desiring to have small quantities not exceeding 1 bushel of new varieties of Roma Crossbreds for trial this season, arrangements for their purchase may be made with the Manager at the same rate—*i.e.*, 11s. per bushel, free on trucks, Bungeworgorai.

Remittance, with exchange added, should accompany order, and be sent direct to the Manager, State Farm.

DIGESTIBILITY OF FODDERS.

By J. C. BRUNNICH and V. S. RAWSON.

[Read before the Hobart-Melbourne meeting of the Australasian Association for the Advancement of Science.]

One of the branches of agricultural chemistry which requires thorough investigation at the present time, and so far has only been attacked in isolated instances, is that of the nutrition of our farm animals. It is our desire in this paper to discuss briefly digestibility tests of certain foods used on the farm, but at the outset it should be mentioned that a short experiment carried out on one sample of each fodder can only act as a general guide, and it would be unwise to accept such figures as are given as a fixed basis without several further experiments being carried out on each special foodstuff.

We believe that the only instance of previous digestibility experiments which have been carried out in Australia were conducted by Professor Perkins on horses some years ago, and so far as we know our experiments are the first which have been carried out with sheep, which, it may be mentioned, have practically the same power of digestion as cattle. When it is considered that similar trials have been made in Germany for the last sixty years and in America since 1884, while now thousands of experiments have been conducted, thus giving reliable data for determining the digestibility of the various fodders used there, it cannot but be felt that we are much behind the times. In England, also, use has to be made of German and American figures, though within the last few years the Institute for Research in Animal Nutrition at Cambridge University has been conducting experiments on these lines under Professor T. B. Wood, F.R.S., and also at the Leeds University under Dr. Crowther similar experiments have been made. Quoting from the former in "Science and the Nation," these words may be said to apply even more to Australia, where the conditions of climate, soil, and growth are so different:—"But in our knowledge there are many gaps, some of which the staff of the Institute were attempting to fill when war interrupted their work. Perhaps the most serious need at the present time is further information as to the composition and digestibility of British fodders. This need is most felt in the case of coarse fodders, such as hay and straw, whose composition and digestibility vary greatly according to variety, cultivation, and harvesting. It is obviously most unsatisfactory that farmers should have to rely on German figures for information as to such material."

It will be of interest before discussing the results of our experiments to give a brief outline of the work which has been carried out in Germany. One of the writers visited Göttingen in 1906, where extensive work is carried out on the nutrition of farm animals under the direction of Professor Lehmann, and is a continuation of the famous Weende Experimental Station, where Henneberg and Stohmann carried out so much of the foundation work. In the Agricultural Institute of the University a large number of feeding experiments are carried out both as regards the digestibility and metabolism of fodders. The latter requires a special apparatus known as a respiration chamber, of which there are several in America and Germany, the general outline of which is as follows:—The animal is kept in a cubic iron box about 8 ft. each way, the plates of which are riveted together and are perfectly air tight. The air entering the chamber is freed from carbon dioxide and the amount carefully registered. The air, on leaving the chamber, passes over calcium chloride to absorb water; then caustic potash, which absorbs the carbon dioxide; then over copper oxide, to oxidise the methane to carbon dioxide, which is again collected as before. Thus the amount of gases given off by the animal can be calculated and at the same time, by collecting the fæces and urine, the complete fate of the food can be accounted for.

An actual experiment carried out was as follows:—

NITROGEN BALANCE SHEET.

SUPPLY.	
N. in food	1.00 gram
EXCRETED.	
N. in urine	0.52 grams
N. in fæces	0.42 grams
Balance	0.06 grams

0.06 gram N. retained by animal equivalent to 0.375 grams of protein.

CARBON BALANCE SHEET.

SUPPLY.	
Carbon in food	30.0 grams
EXCRETED.	
Carbon in urine	2.6 grams
Carbon in fæces	8.3 grams
Breathed out as CO_2	6.4 grams
Breathed out as CH_4	0.2 grams
Remaining in body	12.5 grams
Carbon in 0.375 grams protein	0.198 grams Carbon
Leaving for fat production	12.302 grams Carbon

Equivalent to 16 grams fat.

The most intricate of these chambers is at Bonn, where Professor Hagemann has his animal physiology laboratory. This apparatus measures the quantity of heat radiated from the animal by its absorption in a known volume of water surrounding the chamber and is known as the Atwater Rosa calorimeter. This piece of machinery alone cost £10,000 to bring into complete operation. Mention must also be made of the station at Möckern, where Director Kellner has carried out such classical experiments as are to be found in English in his small book, "The Scientific Feeding of Animals." The appendices of this useful book contain the analyses of about 400 fodders and a large number of digestible co-efficients of the various farm foods.

Though naturally one cannot expect experiments to be carried out in Australia on so large a scale, it is surprising that so little work has been done or so little thought given to the digestibility of Australian fodders. It is hoped that the experiments which are mentioned in this paper will stimulate interest in this connection, though they can only be regarded as an introduction to further investigation of this nature. These experiments were carried out at Yeerongpilly Experimental Station with the permission of the Under Secretary for Agriculture and Stock, where stalls were erected for four wethers of the merino cross variety, and in all the digestibility of nine different foodstuffs was determined, each test being made in duplicate.

FOODSTUFFS TESTED.

Poor bush hay	Lucerne	Wheat pollard
Wheat bran	Maize	Mitchell grass
Maize and millet ensilage	Coarse blood meal	Fine blood meal

So far as could be arranged, the sheep were fed on a maintenance ration throughout the experiment, and there was little variation in their live weight during the whole of the experiments, which lasted for four months. The rations were as follows:—

1. Lucerne.
2. Lucerne; bush hay.
3. Lucerne; bush hay; pollard.
4. Lucerne; bush hay; bran.
5. Lucerne; bush hay; maize.
6. Lucerne; bush hay; maize; coarse blood.
7. Lucerne; bush hay; ensilage.
8. Bran; bush hay; ensilage.
9. Lucerne; hay; pollard, coarse D. blood.
10. Lucerne; hay; pollard; fine D. blood.
11. Mitchell grass hay.
12. Mitchell hay; lucerne.

Each of these rations was fed for a preliminary run of a week, so as to enable the influence of the previous ration to be completely exhausted, and then the fæces were collected each day for twelve days in specially made bags, fitting closely over the hind quarters of the animals. The amount of food was weighed daily, and also

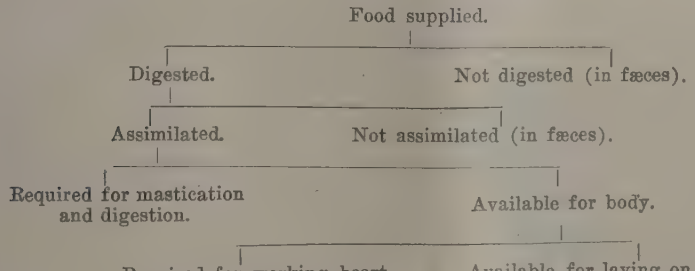
the fæces, one-fifth of the latter being taken and dried, and at the end of the period ground fine, sampled, and analysed. Knowing the amount of nutrients in the fodder fed, from an analysis, and also that in the fæces, one can estimate the amount which the animal digested. It is not considered necessary here, nor will space permit, to give a detailed outline of each experiment, which involved a very large amount of work and calculation, but mention should be made and comparisons given of data from American and German sources. The former are to be found in "Feeds and Feeding," by Henry and Morrison; the latter in the forementioned book "The Scientific Feeding of Animals."

It is also necessary to mention a few terms which will be used in determining the value of the different fodders which are based on the Kellner's standards:—

Starch Equivalent.—The starch equivalent is a convenient method of estimating the protein, fat, carbohydrates, and fibre under one standard, though there is much controversy whether another term should not be applied. Murray, of Reading, and Armsby, of Pennsylvania, are both in favour of using the term "net energy value," and though when properly understood both terms express the extent to which the feed is able either to diminish or prevent loss of stored energy from the body, or to bring about a storage of energy in new tissue. It should definitely be decided which term to apply; otherwise there is bound to be always a certain amount of confusion. The *starch value,* as here given, is the amount of starch that is equivalent to the fat-forming power of all the nutrients in the food. It may be noted—

	Starch.
1 lb. of digestible fat in oil seeds, cakes, and meals	2.41 lb.
1 lb. of digestible fat in cereals	2.12 lb.
1 lb. of digestible fat in coarse fodders	1.91 lb.
1 lb. of digestible carbohydrate and fibre	1.00 lb.
1 lb. of protein	0.94 lb.

The starch equivalent of a food is therefore determined by multiplying the percentage of digestible nutrients by these factors respectively, and, after addition, deducting the amount of energy which the animal uses up in masticating and digesting the food, which is the percentage difference of the static and dynamic value of the food. In the case of coarse fodder (hay and straw) it is advisable to deduct a certain percentage of the total crude fibre in the fodder, varying with the amount contained therein, whereas in concentrated fodders a factor is used for each food known as the "value number." The following table shows the fate of the food:—


Food supplied.
Digested.
Not digested (in fæces).
Assimilated.
Not assimilated (in fæces).
Required for mastication and digestion.
Available for body.
Required for working heart, lungs, &c. Maintenance.
Available for laying on flesh, doing work, milk production, &c.

It should be clearly understood that the amount digested is not strictly given by the "digestible co-efficient," as in the process of digestion certain nitrogenous waste products are given off with the fæces from the alimentary canal, such as bile compounds, mucus, and epithelials cells, also certain nitrogenous compounds as skotol and indol, which are the product of fermentations. The bile also contains a small percentage of fat which makes the digestible fat lower than it really is. These products vary to a certain degree, and naturally with a small percentage of total protein and fat the error is increased. The results obtained, however, are close enough to be of real value to judge the processes going on in digestion of the food tested. The chemical methods which have been instigated for the separation of digestible and indigestible constituents have only proved of value in the case of crude protein, by artificial digestion with pepsin and hydrochloric acid. At the same time it must be remembered that the process of natural digestion shows how much the animal takes up, including the loss of other material from the body, and thus gives the real increase. The term "apparent digestibility" is used at times.

The first experiment had to be conducted on a single food in order to obtain the necessary data on which to base the subsequent calculations. It was hoped to feed the sheep on bush hay alone, as well as lucerne, but they refused to eat it alone, and hence the data are based on a very closely agreement duplicate of the lucerne hay digestibility.

ANALYSIS OF LUCERNE.

—	Organic Matter.	Crude Protein.	Crude Fat.	N.F.E.	Fibre.	True Protein.	Starch Equivalent.
Analysis	80·96	15·95	1·40	38·21	25·40	12·36	..
Percentage digestible	58·00	12·82	·66	28·01	16·51	9·23	39·73
Digestible co-efficient	71·50	80·40	47·1	73·3	65·0	74·70	..
AFTER KELLNER (ANALYSIS OF LUCERNE OF SAME MOISTURE).							
Analysis	82·09	17·33	2·57	33·30	28·89	12·95	..
Percentage digestible	46·78	13·52	1·13	22·31	9·82	9·14	28·12
Digestible co-efficient	57·0	78·0	44·0	67·0	34·0	70·7	..

It will be seen from these figures that though the analysis of the German lucerne gives practically the same figures as our own, yet on examination we find that the organic matter, and especially the fibre, is much more digestible, and hence the true starch equivalent of the lucerne as analysed by Kellner is much lower than the one tested here.

POOR BUSH HAY.

—	Organic Matter.	Crude Protein.	Fat.	N.F.E.	Fibre.	Fine Protein.	Starch Equivalent.
Analysis hay	78·21	2·95	0·77	39·94	34·55	2·63	..
Percentage digestible	45·53	0·45	0·25	21·13	21·70	0·14	23·42
Digestible co-efficient	55·3	15·50	33·5	52·9	62·8	5·90	..

It is impossible to make comparisons of this hay with any from America or Germany, but there are two outstanding features to be noticed:—Firstly, the digestibility of the protein is very much lower than any figures from these countries, as the amount of true digestible protein is practically negligible, whilst on the other hand the digestibility of the crude fibre is considerably higher than the average generally given for poor pasture. These two features emphasize the statement previously referred to by T. B. Wood that the determination of the digestibility of hay and straw is most essential.

POLLARD.

—	Organic Matter.	Crude. Protein.	Fat.	N.F.E.	Fibre.	True Protein.	Starch Equivalent.
Analysis	86·4	14·70	4·26	62·13	5·31	13·11	..
Digestible	66·73	11·60	3·15	49·83	2·15	10·0	68·12
Digestible co-efficient	77·30	78·90	74·1	80·2	40·5	76·90	..
AFTER HENRY.							
Analysis	85·10	17·40	4·9	56·8	6·00	..	..
Digestible	63·8	13·40	4·3	44·3	1·80	..	..
Digestible co-efficient	75·0	77·0	88·0	78·0	30·0	..	..

Compared with the analysis by Henry there is not much difference, only it will be noticed that the digestibility of the fat is much lower, whilst again we notice an increase in the digestibility of the fibre.

(TO BE CONTINUED.)

PISÉ BUILDINGS FOR FARMERS.

The increasing cost of building timber in Queensland is causing new settlers to seek information concerning the cost and method of erecting what are known as pisé houses, the material for which is the soil itself. The most informative article on this style of building we have as yet read appeared in the "Agricultural Gazette of New South Wales" in May, 1907. The whole process of building is therein described, and several illustrations show the process from the foundation to the top of the walls. We have seen these buildings 50 years old in Peru, South America. In January, 1917, we briefly described the method as follows:—

"Having taken up a selection either for farming or grazing, the settler in the old days of the 'colony' of Queensland, forty or fifty years ago, either rigged up a tent for his first home, or, if in a locality where there was plenty of splitting timber or tea-tree, he rose to the dignity of a humpy of low log walls roofed with tea-tree bark, or stripped some sheets of stringy bark and built a bark hut; later on, perhaps, he split slabs and shingles, and dwelt in a fairly comfortable house. In the primeval scrub or forest, this question of housing himself, and perhaps his family, was easily solved. But it was otherwise when the farm happened to be situated on the plains. Then it meant either continuous tent life, or, as the alternative, a galvanised iron or a sawn timber structure, both very expensive in the pre-railway days. Yet, all the time on the treeless plain, all the materials were at hand for the construction of a comfortable weather-proof house, warm in winter, cool in summer, which could be erected by the farmer himself, the only tools needed being a pick, shovel, and rammer, and half a dozen planks.

"The material for the construction of the walls, chimney, and flooring was the soil itself. All that the settler need do is to dig out the soil and shovel it into rough wooden moulds, ramming it down solid in layers of 4 or 6 in. When the mould or box is full and well rammed, it is taken to pieces and erected on another portion of the building, and the work proceeds until the walls and partitions are completed. Any inexperienced man can thus construct a comfortable dwelling, as the actual pisé work presents so little difficulty that it can be done by anyone who has sufficient strength to shovel earth and wield a rammer, and is careful to see that the moulds or boxes into which the soil is shovelled are kept plumb and in straight lines. The services of a carpenter, unless the settler has some knowledge of that trade, will be found necessary to make doors and window-frames and construct the roof, and see that these are set correctly and in their proper places.

"The whole process is well described in the 'Agricultural Gazette of New South Wales' by Mr. G. L. Sutton, Cowra Experimental Farm, 2nd May, 1907.

"In some of the South American States there are numbers of such buildings constructed either of rammed soil or of adobé or sun-dried bricks (for which material like clay can be used, which is unsuitable for pisé work). For the latter, almost any soil containing a fair amount of loam is suitable; but a pipeclay loam, with which gravel is intermixed, is best. Soil which cakes after a heavy rain, or which, if ploughed or dug when dry, turns up in hard clods, is very suitable. Any vegetation growing on the surface of the earth selected must be removed, as also should any roots, bits of stick, or vegetable matter likely to decay. The earth is best used as it is dug, and, if too dry, should be brought to the correct moist condition by watering it about two days before it is to be used. The earth should be just moist enough to be crumbly, and yet adhesive enough to retain the impression of the fingers when pressed in the hand.

"We have culled the above preliminary notes on pisé building from Mr. Sutton's exhaustive description in the abovenamed 'Gazette.' It is stated that pisé buildings are much cooler than buildings constructed with solid brick walls. Some idea may be formed of the durability of pisé by the fact that there is at present, at North Logan, a stable built of pisé which has been in constant use for over sixty years, and which is to-day in good order, notwithstanding the fact that the external walls are unprotected from the weather. Pisé buildings are said to have a life of 150 years.

"It is, however, advisable to protect the walls from moisture, especially from rain, which should be guarded against by surrounding the building with verandas or by overhanging eaves. Pisé buildings not so protected are, however, very common."

TOBACCO-GROWING AT BOWEN.

In our April issue it was stated that the tobacco industry at Bowen was mostly in the hands of Chinese. This is obviously a mistake, as it is at Texas and Inglewood that the Chinese tobacco farmer is mostly in evidence, whereas at Bowen the cultivation of this crop is carried on by white farmers.

Pastoral.

USING RAM LAMBS.

On this subject the Brisbane "United Graziers' Journal" (31st March) writes:—

"When ram lambs are put to a large number of ewes their powers of procreation decline, and they are of little service the following and subsequent years. Notwithstanding the necessity of early returns in these times, says an English authority, the system occasionally advocated of tupping ewe lambs cannot be recommended. Every practical flock master knows that this practice means an arrestment of growth in the sheep and a large percentage of mortality during the lambing season. This is a very serious matter, because stock ewes are usually kept for three or four years, and when they are disposed of at draft sales they, as a rule, realise very unremunerative prices by reason of their stunted growth. It is a mistake to suppose that they will overcome the check which immature maternity has given them, because it occurs just at the time when sheep really put on most of their growth and they will never reach the same standard of size and vigour as sheep that are put to the ram the first time as shearlings."

BLOW-FLY DEMONSTRATION.

The demonstration in connection with the blow-fly pest which was in our April issue announced to take place at Dalmally, near Roma, during the second week in April, has been postponed until 13th May. In addition to a large number of Queensland pastoralists, it is expected that there will be others from New South Wales and Victoria. Dr. Harvey Johnston will be in charge of the demonstration, and will deliver an address on the subject.

THE SUGAR SEASON.

CRUSHING DATES.

The "Queensland Sugar Journal," 8th April, publishes the following information concerning the probable dates when the sugar mills will commence crushing:—

Alberton Sugar Mill, *viâ* Yatala.—Towards end of August.

Australian Sugar Company, Limited, Mourilyan Mill, Mourilyan.—First week in June.

Babinda Central Sugar Mill, Babinda.—Somewhere about the third or fourth week in May.

Cattle Creek Sugar Company, Finch Hatton, Mackay.—About middle of July.

Childers Mill, Childers.—22nd June.

Doolbi Mill, Isis.—Probably be some time in August.

Eagleby Mill, *viâ* Beenleigh.—First week in September.

Fairymead Sugar Company, Limited, Bundaberg.—Towards end of July.

Farleigh Estate Sugar Company, Mackay.—About middle of July.

Gibson and Howes, Limited, Bingera Plantation.—Early in July.

Goondi Mill, Innisfail.—1st June.

Hambledon Mill, *viâ* Cairns.—1st June.

Homebush Mill, Mackay.—1st June.

Inkerman Mill, Ayr.—About 1st July.

Macknade Mill, *via* Halifax.—1st June.

Marian Central Mill Company, Mackay.—About middle of July.

Maryborough Sugar Factory.—Every likelihood of first week of August.

Mulgrave Central Mill Company, Limited, Gordonvale.—1st June.

North Eton Central Mill, North Eton, Mackay.—About the beginning or middle of July.

Pioneer Mill, Ayr.—About 1st July.

Pleystowe Central Mill Company, Mackay.—About mid-July.

South Johnstone Central Sugar Mill, Basilisk, *viâ* Innisfail.—26th May.

Victoria Mill, Ingham.—1st June.

W. Heck, Pimpama Island.—First week in August.

Dairying.

DAIRYING AT ROMA.

The dairying industry is thriving in the Roma district, and has developed out of all proportion to the number of years it has been established. Suppliers from July to March have been paid £50,000. This is more than the amount paid for any two previous years. For the past eight months the cream supplied to the local factory amounted, in one case alone, to £1,000, and many other farmers have received £500.—Exchange.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING MARCH, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1921.	Mar., 1920.		Mar.	No. of Years' Records.	Mar., 1921.	Mar., 1920.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	8·26	20	26·25	1·02	Nambour	9·70	25	13·70	6·10
Cairns	17·86	39	32·21	6·96	Nanango	3·37	39	6·28	1·28
Cardwell	16·37	49	18·38	5·68	Rockhampton ...	5·10	34	3·84	1·61
Cooktown	14·75	45	25·48	3·52	Woodford	8·20	34	12·16	1·85
Herberton	8·03	34	21·13	1·86					
Ingham	16·28	29	15·26	8·09					
Innisfail	25·20	40	62·62	8·01					
Mossman	18·13	13	32·78	9·07					
Townsville	7·99	50	2·93	1·86	*Darling Downs.*				
					Dalby	2·80	51	1·18	0·62
					Emu Vale	2·77	25	0·61	1·90
Central Coast.					Jimbour	2·67	33	2·15	0·74
					Miles	2·80	36	2·10	0·45
Ayr	7·40	34	6·48	1·55	Stanthorpe ...	2·82	48	1·77	2·03
Bowen	5·87	50	11·71	0·61	Toowoomba ...	3·93	49	5·15	1·25
Charters Towers ...	3·60	39	5·44	1·17	Warwick	2·92	34	0·82	1·49
Mackay	12·30	50	28·58	2·45					
Proserpine	11·94	18	26·87	5·75					
St. Lawrence ...	6·10	50	4·50	0·25	*Maranoa.*				
					Roma	2·85	47	3·01	0·29
South Coast.									
Biggenden	4·33	22	4·08	1·55	*State Farms, &c.*				
Bundaberg	5·61	38	3·31	1·72					
Brisbane	5·89	70	7·86	1·80	Bungeworgorai ...	1·67	7	2·78	0·59
Childers	5·22	26	4·45	2·18	Gatton College ...	3·55	22	3·64	1·88
Crohamhurst ...	12·30	25	14·04	4·15	Gindie	2·98	22	1·06	2·06
Esk	4·92	34	5·44	2·31	Hermitage ...	2·77	15	6·29	1·34
Gayndah	3·29	50	4·29	2·32	Kairi	4·68	7	31·17	1·58
Gympie	6·33	51	6·73	2·31	Sugar Experiment Station, Mackay	11·33	24	26·31	2·04
Glasshouse M'tains	9·43	13	14·60	2·52	Warren	3·08	7	2·11	5·95
Kilkivan	4·07	42	4·70	0·52					
Maryborough ...	6·44	50	5·10	2·24					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for March, 1921, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, MARCH, 1921.

The seventeenth egg-laying competition at Gatton terminated on 31st March. Heavy moults were prevalent from the 10th of the month, due to a sudden change in weather, a week of continuous rain following after a term of hot weather. The birds returned bear sealed rings with numbers of eggs laid, of 2 oz. or more, for 360 days. The following identification rings were attached to all birds competing in the single tests:—A., green; B., red; C., yellow; D., blue; E., grey; F., white. There were two deaths during the month, viz.: Messrs. C. M. Pickering and G Flugge each lost a bird, the cause of death being paralysis in both cases. The following are the individual records:—

Competitors.	Breed.	March.	Total.
LIGHT BREEDS.			
*G. Trapp	White Leghorns ...	99	1,517
*J. M. Manson	Do.	126	1,489
*Haden Poultry Farm	Do.	97	1,469
*O. W. J. Whitman	Do.	71	1,459
Mrs. R. Hodge	Do.	108	1,431
*J. Newton	Do.	75	1,427
*Quinn's Post Poultry Farm	Do.	75	1,412
*L. G. Innes	Do.	74	1,406
Geo. Lawson	Do.	85	1,404
*E. A. Smith	Do.	94	1,395
*W. and G. W. Hindes	Do.	124	1,392
*Dr. E. C. Jennings	Do.	65	1,384
*N. A. Singer	Do.	69	1,383
*J. J. Davies	Do.	63	1,382
*T. Fanning	Do.	83	1,379
*W. Becker	Do.	50	1,372
*H. Fraser	Do.	88	1,341
*G. Williams	Do.	62	1,321
*J. H. Jones	Do.	60	1,319
*Mrs. L. Anderson	Do.	78	1,311
*Thos. Taylor	Do.	68	1,311
S. L. Grenier	Do.	91	1,306
*B. Chester	Do.	83	1,302
*Mrs. L. Henderson	Do.	65	1,282
Thos. Eyre	Do.	90	1,276
*S. McPherson	Do.	75	1,270
E. Chester	Do.	83	1,230
S. Chapman	Do.	103	1,221
Avondale Poultry Farm	Do.	80	1,219
R. C. J. Turner	Do.	102	1,199
*Range Poultry Farm	Do.	40	1,198
H. A. Mason	Do.	91	1,183
W. Morrissey	Do.	84	1,175
H. P. Clarke	Do.	38	1,168
C. Langbecker	Do.	72	1,167
S. W. Rooney	Do.	34	1,161
C. M. Pickering	Do.	76	1,139
W. D. Evans	Do.	104	1,125
C. H. Towers	Do.	84	1,099
C. A. Goos	Do.	42	1,081
A. J. Andersson	Do.	73	1,050
Miss E. M. Ellis	Do. ... Withdrawn		583

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Feb.	Total.
HEAVY BREEDS.			
*A. Shanks	Black Orpingtons ...	124	1,476
*R. Burns	Do.	90	1,444
*E. F. Dennis	Do.	52	1,337
*E. Morris	Do.	87	1,364
*R. Holmes	Do.	72	1,355
*J. Cornwell	Do.	106	1,333
*A. Gaydon	Do.	75	1,322
H. M. Chaille	Do.	101	1,308
*D. Fulton	Do.	70	1,307
*A. E. Walters	Do.	91	1,255
Mrs. G. H. Kettle	Do.	82	1,243
Parisian Poultry Farm	Do.	90	1,238
*W. Smith	Do.	39	1 231
J. E. Smith	Do.	78	1,207
*E. Oakes	Do.	50	1,206
G. Muir	Do.	78	1,188
*R. B. Sparrow	Do.	43	1,185
R. C. Cole	Do.	98	1,184
*T. Hindley	Do.	48	1,176
*J. E. Ferguson	Chinese Langshans ...	83	1,109
*E. Stephenson	Black Orpingtons ...	75	1,096
*Nobby Poultry Farm	Do.	66	1,042
G. Flugge	Do.	83	1,026
Total	...	5,005	84,410

* Indicates that the pen is being single tested

DETAILS OF SINGLE PEN TESTS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
G. Trapp	263	256	265	235	262	236	1,517
J. M. Manson	226	258	264	260	246	235	1,489
Haden Poultry Farm	273	200	250	268	238	240	1,469
O. W. J. Whitman	243	230	270	239	206	271	1,459
J. Newton	270	239	254	174	243	247	1,427
Quinn's Post Poultry Farm ..	264	242	238	196	223	249	1,412
L. G. Innes	174	231	233	265	269	234	1,406
E. A. Smith	228	198	259	229	240	241	1,395
W. and G. W. Hindes	220	242	209	249	239	233	1,392
Dr. E. C. Jennings	165	279	201	215	249	275	1,384
N. A. Singer	251	191	234	285	222	200	1,383
J. J. Davies	258	234	233	197	250	210	1,382
T. Fanning	139	233	224	253	272	258	1,379
W. Becker	244	243	243	227	193	222	1,372
H. Fraser	156	236	240	247	242	220	1,341
G. Williams	198	235	233	218	252	185	1,321
J. H. Jones	218	224	235	242	212	188	1,319
Mrs. L. Anderson	263	247	236	190	169	206	1,311
Thos. Taylor	255	215	195	234	221	191	1,311
B. Chester	237	190	246	200	227	202	1,302
Mrs. Henderson	202	223	221	192	226	218	1,282
S. McPherson	261	265	91	138	269	246	1,270
Range Poultry Farm	147	188	221	235	180	227	1,198
S. W. Rooney	168	186	226	174	195	212	1,161

RESULTS OF SINGLE PEN TESTS—*continued.*

—	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
A. Shanks	215	266	235	296	202	262	1,476
R. Burns	244	224	277	215	247	237	1,444
E. F. Dennis	260	216	194	268	216	233	1,377
E. Morris	237	230	227	197	246	227	1,364
R. Holmes	216	225	211	222	258	223	1,355
J. Cornwell	215	247	238	157	219	257	1,333
A. Gaydon	195	282	206	194	184	261	1,322
D. Fulton	228	232	209	254	92	292	1,307
A. E. Walters	199	209	194	228	184	241	1,255
W. Smith	110	246	236	235	219	195	1,231
E. Oakes	180	243	178	103	241	260	1,206
R. B. Sparrow	217	140	216	187	176	249	1,185
T. Hindley	207	248	205	174	161	181	1,176
J. E. Ferguson	151	188	141	192	234	203	1,109
E. Stephenson	213	175	209	188	166	145	1,096
Nobby Poultry Farm	199	281	86	279	177	20	1,042

CUTHBERT POTTS,
Principal.

AERIAL FOREST RECONNAISSANCE.

In an interesting article on the Survey of Forests from the air, by J. M. Swaine, Chief, Division of Forest Insects, which appeared in the January-February number of the "Agricultural Gazette" of Canada, an account is given of an experiment in aerial forest reconnaissance which was conducted last summer over the country north and west of Lake Timiskaming in Northern Ontario. The results of this experiment were very satisfactory, not only as regards the mapping out the main timber types such as conifers, hardwoods and mixed forests, recent burns and clearings in approximately 1,800 square miles of the regions surveyed from an altitude of 3,500 feet, whence it was possible to distinguish the more conspicuous species of trees and to secure a comprehensive knowledge of the forest conditions on a large area in a very short time, but, furthermore, with respect to the study by officers of the Division of Forest Insects of the Entomological Branch, of an extensive spruce bud worm outbreak spreading through the northern pulp-wood forests from Northern Quebec across the interprovincial boundary into Ontario. A strip of country, more than 100 miles long and 25 miles wide had been freshly infested during the last two summers, and the injury was spreading westward.

It was very important to determine the area covered by the outbreak last summer, and to obtain definite data upon the rate and direction in which the injury was spreading. A ground party attempted to obtain this information, but it was impossible to cover the whole area in that manner before winter, and to obtain it by a ground survey it would have taken two men at least eight months, whilst by the use of a Curtiss flying boat only three weeks were spent in the aerial survey. Much of the Temagami country carries strips of hardwoods with pine along the water-courses, and since the latter offers the only available route for a rapid survey, it is evident that a ground party must have difficulty even in locating the spruce and balsam stands. To this is added the drawback that the party cannot foretell how far or in which direction it must travel to reach the boundaries of these or of the infestation.

The possibilities of an aerial survey appealed strongly to the chiefs of the Forest Division, and the results were even beyond their expectations. The Air Board furnished a Curtiss flying boat, type F3, with a wing spread of 78 ft., and equipped with a 360 h.p. Liberty engine, which carried two observers and a pilot and three passengers. The trip from Ottawa to Haileybury, covering 336 miles, was made in five hours flying time.

There are still vast forests in Queensland and the Northern Territory which could easily be reached and mapped out in a similar manner if only the aeroplane were made available.

The Orchard.

THE CAPRIFICATION OF FIGS.

During the months of February and March last, a fair quantity of figs was placed on the market, and met with a ready sale at good prices. The fruit, however, was not notable for size, being much smaller than the Smyrna. We have not yet heard of any grower who is acquainted with the methods of cultivation and treatment of this fruit as carried out at Smyrna, where the two best varieties of figs are grown. Smyrna is a district and city of the Province of Aidan, in Asia Minor, south of Constantinople, and situated on the Mediterranean Sea, in about the same latitude as Sydney, New South Wales. There are two varieties of the famous Smyrna fig known in the trade as "Sari lop" (the dried fig) and the "Bardajik," usually eaten in a fresh state. The peculiarity of these figs is, that their skins under favourable conditions, dry tender, which is not the case with other varieties, and, as a dried fig cannot be peeled, its skin influences its quality and value considerably.

The "Sari lop" is a large fig, hence the great demand for it in foreign markets, but the "Bardajik," though smaller, makes a sweeter and finer flavoured dried fig. This latter is called "Sheker Injir" (sweet fig) in its dried state.

The fig grows very easily from cuttings, grafting, or seed. Preference is given here to cuttings, which are planted out where they are to grow into trees. The cuttings strike root very easily. The custom is to put the cuttings in the ground at an angle of about 45 in., buried right up to the top with only the leaf bud appearing above the soil; and, for protection in frosty weather, the bud also is covered temporarily with an inch or two of soil. Cuttings bear fruit in three or four years. Off-shoots or suckers are sometimes used; these are cut off the parent tree with a few small roots attached.

For the fig to reach full-sized maturity caprification must be resorted to, which is carried out by a very small fly.

This fly coming from the edible fig deposits its eggs in the seed of the fruit of the wild fig-tree, which bears an autumn fig called "Bogha," and passes thence to a fig appearing in the spring on the same tree called the "ilex," commonly and erroneously known as the "male" fig.

The edible fig-tree bears fruit later than the second crop of the wild fig-tree, and the fly passes on to that in turn and then back to the "Bogha" fig.

In order to control the caprification, it is found desirable that the wild tree should be planted apart from the edible fig-tree. Over caprification is apt to spoil the fig, which drops off prematurely as a result.

This fly is considered esesntial to the successful growing of the Smyrna fig, but so far it has not been exactly decided whether for cross fertilisation from the wild fig or merely from one fig to the other of the same variety.

Five to twenty "ilex" figs are hung in strings when ripe on each edible tree, according to size, and there left until the fig season is over.

The wild fig-tree is more subject to frost. Though leafless during the winter, the "Bogha" fig, then on the tree, continues growing, and it is supposed that the necessary movement of the sap renders the tree more tender than the others of the genus which are then in a dormant state.

All the Smyrna varieties grow anywhere in this district within a certain distance from the sea (about 100 miles) and prefer calcareous soil, but all figs become sweeter growing on hillsides with a southerly aspect. Too much moisture spoils the quality of the fig, though the crop may be greater and the size of the fruit larger. Young trees always produce the finest fruit.

When the fig, either the "Sari lop" or "Barkajik," reaches maturity it requires dry weather to make it white and mellow. At this season, August and September, the prevalent winds are from the north and east, and, being dry, they are well adapted to the requirements of the fig.

The dried fig is a product of the Meander Valley, where the climatic conditions allow it to dry properly. This is attributed to the conformation of the valley, which is protected by hills from the sea breezes. The soil, which also plays so important a part in the cultivation of the fig, is calcareous here; there are also iron mines in the neighbouring hills, and it is claimed by one authority that ferruginous detritus helps to make this district the garden of the fig. The best districts in the Meander Valley are Inovassi (between Karabounar and Baladjik) and Ortaxe. The lastnamed district produces a fig superior in size, richness of pulp, and thinness of skin. In Strabo's time the figs of Antioch, which town possessed a large tract of country on both sides of the Meander, were noted as the dry figs of Antioch, and the tree on which this variety grows is called "Trephyllus."

Ortaxe is close to Antioch.

All attempts to produce it successfully elsewhere than in the Meander Valley having failed, the dry fig has come to be looked upon as a peculiarity of this district. Valleys in the neighbourhood apparently identical have been tried without success.

The fig is allowed to remain on the tree until it begins to drop off, when the crop is gathered by hand or knocked off by sticks. The partially dried fruit is spread on mats to dry in the sun for three or four days, and is then sent to market.

The operator, in "working" the figs for packing, dips his fingers into brine to prevent them from becoming sticky. The salt, besides destroying the worm to which the dried fig is subject and acting as a preservative, is supposed to help in the sugaring process. Some recommend immersion in boiling brine as a means of sterilisation. The figs are put in baskets or perforated metal drums and immersed about five minutes in the boiling brine. It is contended, however, by others that this process alters the taste of the fig and spoils those of the finer quality.

The figs when ready are shipped in small boxes or bags.

For home consumption dried figs are sometimes baked to a light-brown colour; baking gives them a pleasant flavour. Sometimes the figs are stuffed with walnuts or other nuts and spice, then sprinkled with sesame seed before baking.

No. 319 Bulletin of the College of Agriculture, Agricultural Experiment Station, Berkeley, California, has an interesting and educational article by I. J. Condit, on "Capri Figs and Caprification" (writes an Exchange).

"The capri or wild fig is the natural habitat of the fig wasp known scientifically as *Blastophaga grossorum*, which is now used extensively in California and to a lesser degree in the Commonwealth for consummating the process known as caprification of figs. A tree containing the fig wasp is growing in the Government Orchard at Hackney, and is a source of interest to some of the students who attend the practical lectures given there by Mr. George Quinn, Horticultural Instructor to the Department of Agriculture. The superior quality of dried Smyrna figs has been long recognised by connoisseurs, but the reason for their superiority was not disclosed until it was discovered that the native growers of Smyrna made a practice in the spring of the year of suspending the wild fruits of the capri fig in the Smyrna trees. From these capri figs there issued hundreds of the minute wasps already named, which entered the eye of the Smyrna fig and caused the fruit to set. Where this operation was neglected, the small Smyrna figs soon turned yellow and dropped off. On account of the very rapid growth of the fig industry in California, and the recent large plantings there of Smyrna figs, there is a keen demand, according to Mr. Condit, for practical information about varieties of capri figs, cost of caprification, and methods of distributing the figs in the orchard. It is the purpose of this publication to present the latest and most reliable information on the points mentioned, as well as on others of prime importance to the fig-grower. The bulletin is appropriately illustrated and ought to meet the needs of the fig-grower."

PROLIFIC LEMON TREES.

In a previous Journal we have drawn the attention of lemon-growers to the very successful work of Mr. H. W. Lambert at Paddington, in the suburbs of Brisbane. We have just received a branch of eleven well-grown fruits from him, which are large and very juicy. There are eleven fruits on the portion of the branch here reproduced, and they contain more juice than those of the Lisbon lemon. The tree from which this sample was taken bears a very heavy crop, and markets profitably.

Plate 23.—A Prolific Lemon.

SPECIAL INTERSTATE FRUIT TRAINS.

For the week ending 9th April, three special fruit trains were dispatched by the Southern Queensland Fruitgrowers' Society, Limited, carrying the following fruit cargoes for the South, clearing at Wallangarra. Consignments would have been still larger had it not been for the heavy rains resulting in almost impassable roads, which prevented many growers from reaching the railway stations in time for dispatch.

Three hundred and seventeen and a-half tons were destined for Melbourne, and 117½ tons for Sydney. The description and quantities of the fruits sent South for Sydney were 8,281 cases, of which 6,354 were bananas, 1,579 pineapples, 343 cases of citrus fruit, and 6 cases chocos. For Melbourne there were 4,352 cases of bananas, 721 cases of pineapples, and 281 cases of citrus fruits.

District tonnage sent was: North Coast to Melbourne, 152¾ tons, and 36½ tons to Sydney; total, 189 tons (Landsborough transhipping 55¼ tons); Dayboro line to Melbourne, 12½ tons; Currumbin to Melbourne, 35 tons, and 3½ tons to Sydney (total, 38½ tons); Tweed Heads to Sydney, 75¾ tons.

Mr. W. Ellison, manager of the South Queensland Fruitgrowers' Society, lately reported that for the month of February the special trains chartered by the society carried a total of 1,753¾ tons of fruit—1,074 tons went to Melbourne and 679 tons to Sydney. In all, 46,500 cases were carried—28,400 bananas, 17,836 pines. The balance was made up of tomatoes, passions, &c. The loading for the past seven months was 7,925 tons, compared with 5,447 tons for the same period last year. For the two weeks ending 5th March, 1921, special trains carried a total of 1,085 tons of bananas, pines, &c., 645 tons being sent to Melbourne and 439 tons to Sydney. In addition to the above, fruit has also been attached from Stanthorpe.

WEEDICIDE.

A correspondent of "Land," Sydney, asks for information as to a good chemical for the destruction of weeds on a plot of ground 40 feet by 100 feet, and also wants to know whether any such application of a remedy would be injurious to trees, plants, and vegetables in three or four months' time. We ("Q.A.J.") do not know the virtues of all the forms of Weedicides, but the following useful reply was given by the journal named, and we commend it to the notice of Queensland gardeners:—

"As your piece of ground is not a large one, we would recommend 'Weedicite,' 1 gallon to 100 gallons of water. This quantity is sufficient to kill every surface plant on an area of 400 square yards. It will not injure trees, but do not allow the mixture to go on flower beds, as it rapidly destroys all vegetable life with which it comes into contact. Another remedy is arsenate of soda, 1 lb. to 2 gallons of water. A watering can is a good medium for spraying the poison. It is as injurious to plants as 'Weedicite,' and it must not be allowed to go on trees. If the grass and weeds are killed, you should allow three or four months before planting."

GAS POWER FROM WASTE WOOD.

"The progress which has been made by British firms in the construction of suction gas plants for utilising waste wood is of special interest to many countries overseas, where there are large quantities of this material available. These plants distil the wood and produce gas which is of excellent quality for use in gas engines. This method of utilisation is much more economical for power-producing purposes than burning under a boiler. A recent example of a large installation on these lines is afforded by a mine in a British dominion, where a British firm has supplied four suction gas plants capable of yielding a total output of 1,400 horse power. The fuel used is in the form of logs up to 2 feet long and a foot in diameter; and the gas is applied to the driving of four horizontal gas engines. Three of the engines drive electric generators, and the fourth is coupled to an air compressor for operating pneumatic drills and hammers in the mine."—"Industrial Publicity," London.

[There are vast quantities of waste wood in our forests all over Queensland, waste timber which will never be used for any purpose. From the above paragraph it would seem that such wood can be turned to very good account.—Ed. "Q.A.J."]

Tropical Industries.

THE SOUTHERN SUGAR DISTRICTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Field Assistant, Mr. J. C. Murray:—

During the month, cane areas have been inspected at Mount Bauple, Cooroy, Nambour, and Beenleigh.

MOUNT BAUPLE.—The prospects here are better than they have been for some years. The cane crops are growing strongly, and by cutting time, on present appearances, should yield both weight and density. This is more especially the case with the plant crop of last year, as cane planted previously to 1920 received a very severe check with drought; so much so that it is surprising to find the ratoons doing as well as they are. A certain amount of disease is noticeable in the field this year, although not to any great extent. The variety known as D. 1135 is, perhaps, the worst inspected, this cane being checked in places by a condition commonly known as "red rot." The disease is distinguished by a rust coming on the leaf, and by a cracked and attenuated stem. Fungoid parasites make their appearances near the ground, and the root system, on examination, is parched and bound. Fortunately, only small areas are attacked, and if farmers plough out the diseased cane and let the land rest for twelve or eighteen months, the disease will probably disappear. Lime would be beneficial before replanting.

Regarding varieties, those at present doing well are M. 1900, D. 1135, H.Q. 813, H.Q. 222, D. 113, and Badila. There are a number of other canes being planted, having recently been obtained from Bundaberg Sugar Experiment Station. There are some good varieties among these, including Shah. No. 10, N.G. 81, Q. 1018, Q. 97, and E. K1. Practically no trouble is being experienced just now with cane pests. Borers are attacking the cane in isolated patches, but not sufficiently as to cause alarm. The Mount Bauple area generally looks very green, the pasture being in good condition. Live stock are doing well.

COOROY.—Very little cane is grown at Cooroy, although some farmers are seriously thinking of planting on a larger scale than hitherto. The country is so suitable for dairying and fruit raising that it is questionable whether anything else would pay as well. Transport is also a serious problem as far as sugar-cane is concerned. Of the few farmers who have a little planted, it can be said that they have worked hard, and the cane is growing well. The land, however, is inclined to acidity, and better results could be obtained with liming. D. 1135 is the principal variety grown. Frosts are occasionally severe between May and September.

NAMBOUR.—Owing to continuous heavy rains, not a great deal was seen of the Nambour district during this visit. The crop is, however, going to be a good one. Both the plant and ratoon crops are looking well, and will probably put on a couple of feet of cane yet before the season closes. As far as could be observed, the cutting season will begin fairly early.

No new varieties were noticeable since last visiting Nambour. On present appearances 1900 Seedling, D. 1135, H.Q. 285, and H.Q. 813 seem to be making the most satisfactory growth. There are three important items that the growers could give more attention to in this district, and they are, liming, green manuring, and draining. By paying attention to these matters, the growers would increase their tonnages considerably.

BEENLEIGH.—Much of the country in this fertile district is devoted to pursuits other than cane growing, but there are still a number of farmers who grow cane, though they are not entirely dependent on it. Most of the land around Beenleigh would produce sugar, although it is not ideal owing to the likelihood of frosts, which sometimes occur with considerable severity between May and October.

However, the different varieties of cane that are being raised at present look well, and there should be a fair quantity for milling next season. Probably the best grown of these, and the most promising, is the H.Q.813. One grower, Mr. Rowe, has a particularly fine planting of this cane, and growers would be well advised to give it a fair trial. Other varieties, such as 1900 Seedling and D. 1135, are making good headway. The soil requires lime and green manures; also a little more drainage on the river farms would be beneficial. The cane is practically free from injurious pests. Occasionally grubs are in evidence, but so far have done no damage. River transport is at present difficult owing to the tremendous masses of water lilies.

BUNDABERG (WOONGARRA AND BAROLIN).—The prospects for a good season look better in the Bundaberg district than they have done for some time. The cane is growing satisfactorily, and farmers are confident that they will get a fair return this year. The season has been a good one since the New Year, and the soil is in a suitable condition. With the disappearance of the old drought-stricken cane that was on many of the fields prior to last planting, a considerable slackening off is noticeable in cane pest attack, although it would still be as well for the farmers not to have any useless cane stand on the land for horse feed, &c., as this precedure encourages borers, and forms feeding grounds for the cane grub. There is no doubt that a great deal of the soil in the Woongarra and Barolin areas would be benefited by the greater use of vegetable manures, either cow pea or Mauritius beans.

Since last reporting on the above areas, the different varieties distributed by the Experiment Stations have made good growth. At present the five most suitable varieties of the older canes appear to be D. 1135, 1900 Seedling, H.Q. 285, Badila, and Clark's Seedling, H.Q. 285 looks particularly well and growers ought to plant more of this cane. It is an early maturing variety of good sugar content.

THE NORTHERN SUGAR DISTRICTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Northern Field Assistant, Mr. E. H. Osborn:—

The Ayr District, comprising the Haughton Mill, Pioneer, Kalamia, and Inkerman was visited recently, and the following notes were taken:—Everywhere land is being prepared to plant from April onwards. Tractors, mostly Mogill and Titan, are in use, but the heavy cost of fuel makes their use very expensive now, and in consequence horses are doing most of the work.

The bulk of the soil here consists of heavy, dark, deep loam upon and adjacent to the river bank and creeks; and a somewhat similar class of lighter soil, but more shallow upon the higher grounds. All of it is, I think, capable of growing first-class crops of high density cane if only an average rainfall, evenly distributed, eventuates. No rocks or gravel are to be seen. As regards lime, I understand that good lime can be obtained from the Reed River at a reasonable cost. Green manuring has not been gone in for much, as several farmers tried to procure same and failed. Mrs. Hayward, near Inkerman, has a very nice block of first ratoons—half Badila and half Clark's Seedling—as the result of a heavy application of filter press manure obtained from Inkerman. The cane looks remarkably green and healthy now.

Very little irrigation is carried on at the Haughton, although the cane looks very well without it. Probably this is accounted for by the extra rain that this district always gets. For instance, in three days in March, 14.45 inches fell there, whilst up to the 27th of March under 6 inches was the total for Ayr.

At Pioneer and Kalamia, irrigation is usual; whilst at Inkerman, although plenty of plants are being used with good results, the majority of growers are awaiting the completion of the irrigation scheme. This will increase the Inkerman supply very materially.

Taking the general outlook from a cane point of view, the cane, although very green and well stooled out, is backward owing to the dry spell in February. As one grower remarked, "It is a bit over the odds to have to think of watering in our wet season (February and March)." Unless a fall occurs very soon a lot of the farmers talk of watering again.

The varieties of cane most grown here are Badila (about 40 per cent. of crop), the Gorns, 24, 24a, 24b, Clark's Seedling, B.208, Q.813, Q.855. Of the last two, Q.813 is most popular, on account of its better striking qualities. Very little ratooning is done beyond the first, except on the best of the soils, as it is said not to be too payable. On some of the better soils second and third ratoons have been more successful. The mills expect to start crushing early in July; and, although it is hard to get an accurate estimate of the total tonnage, it should probably be in the vicinity of 240,000 tons, *i.e.*:—

Haughton	25,000 tons
Pioneer	70,000 tons
Kalamia	65,000 tons
Inkerman	80,000 tons
	240,000 tons

This amount will, of course, depend upon the weather in the near future, to a certain extent.

This district has so far been very free from disease or insect pests, although a few grubs were in evidence at the Haughton last year.

Mr. Wright, a grower there who suffered a little from them, replanted and used about 40 lb. of arsenic to the acre with his cane plants. He used it after the plants had been slightly covered with soil, and then added the balance of soil covering. The results of this experiment will be instructive.

In conclusion, I would like to thank the various gentlemen who gave me all the information at their command, and in fact helped me in every way that they could. Such assistance is much appreciated.

OF INTEREST TO TOBACCO-GROWERS.

Tobacco growers in Queensland who no longer have the advantage of the valuable instruction given by the late Mr. Neville, who, for several years directed the industry, both in the south and far north of Queensland, will doubtless find some information which will be of advantage to them in the following article by W. H. Scherffius, M.S., Chief of the Division of Tobacco and Cotton, Ceylon, taken from the February, 1921, issue of the "Tropical Agriculturist," Peradeniya, Ceylon:—

FACTORS THAT AFFECT THE GROWTH, REPRODUCTION, AND MATURITY OF TOBACCO.

The various factors that affect the development of a crop of tobacco are numerous. Probably the most important are light, temperature, moisture, chemical changes, and fertility of soil.

Light.—I have purposely mentioned light first, as too frequently we attach more importance to the other factors mentioned and leave light out of consideration. A number of investigators have given special attention to this phase of plant life, and their results have indicated that light plays a most important part in the growth and reproduction of plants. This topic might be viewed from three directions, namely: (1) Intensity of the light; (2) the quality—that is, the wave lengths of the radiation; and (3) the duration.

As regards intensity of the light, there seems to be an optimum amount suited for each plant species, and that optimum may be more or less than the full intensity of the sun's light on a clear day in a particular quarter of the globe. Within certain limits a reduction of the intensity of the light has a tendency to lengthen the axis and branches and also to increase the superficial area of leaf surface of a good many species of plants.

The effects produced by different spectrum rays are very marked, though nothing very decisive can be stated at present. Under the influence of red rays of light certain species of plants show an abnormal elongation of the axis, while under green and blue rays the length of the axis is markedly reduced. Some plants show the greatest growth under white light.

The duration of daily exposure to light seems to have an important bearing on the period of vegetative growth of certain species, the lengthening of the daylight period, showing a considerable shortening of the period of vegetative growth, larger seeds produced, and an increase in the flavour and aroma. The exclusion of light prevents the development and functioning of the seed-forming agents, or sexual reproduction; on the other hand, the length of the seasonal daylight, or if supplemented by artificial light, is a dominant factor in developing the staminate and pistillata reproductive organs, and, therefore, the existance of the species.

Only moderate shortening or lengthening of the daylight period tends to retard or accelerate, as the case may be, the sexual reproduction. If the daylight period is too short for production of seed the plant tends to gigantism or indefinite vegetative development; while under the influence of the correct length of daylight for a particular species an abundant flowering and fruiting may be expected. Thus certain varieties may act as late or early maturing, depending on the amount of daylight they may be exposed to as compared to the optimum requirements of that species or variety.

Annuals, biennials, and perennials may also be the results of seasonal range of daylight, as many species are, in a measure, governed by length of daylight rather than the retarding influence of winter. Therefore, certain annuals may complete

two cycles of reproduction in a single season by subjecting the plants to a suitable length of daylight or artificial light. Similarly, under certain reduced light exposures, some annuals behave like non-flowering perennials.

Apparently the rate of growth is directly proportionate to the length of daily light exposure.

From the above one would conclude that the proper time for seeding in order to get the correct amount of sunlight is important, and that the seasonal range of daylight is an important factor in controlling the natural distribution of plants.

Temperature and Moisture.—The various factors mentioned previously are so vitally dependent one upon the other that it is important to bear in mind that one of these factors, such as temperature, will not give results approaching perfection without the other conditions being favourable to the production of the crop. Tobacco is a plant which is very sensitive to its surroundings, and we must not expect a good development if the conditions under which we compel the plant to grow are unfavourable. To obtain the fullest development in growth the plant requires a humid atmosphere and a fairly high temperature, though in my opinion it attains its greatest perfection in temperate zone heat. It has, however, been very clearly demonstrated that certain varieties or types of tobacco will make good development under the influence of high temperature, while others show poor development. A notable example of this is found in the White Burley types. They seem to reach the highest degree of perfection in the Blue Grass Region of Kentucky; there is, however, another factor which plays a vital part in this connection which will be mentioned later. White Barley tobacco, when planted in this country, with occasional expections, seems to become somewhat dwarfed, and the different individuals show a lack of uniformity in their growth, and not infrequently the leaves show a parched or dried condition during the growing period. It seems to thrive best in rather a humid atmosphere and with a moderate temperature.

Cigar wrapper tobacco, which is probably the most highly specialised type grown, seems to thrive best and reach the highest degree of perfection in growth, flavour, and aroma, in a high temperature with a fair amount of humidity. During the curing or drying stage, to obtain the best results, the tobacco planter must use his best judgment in this process, as the method of handling his crop depends largely on the type of tobacco he is attempting to produce. For example, in the production of cigar wrappers the curing process is an alternating one, in which the tobacco should partially dry during the day and at night it should absorb a certain amount of moisture; this process is called "running"—*i.e.*, the cured portion of the tobacco gradually changes from a yellow or green colour to a light mahogany brown. In the production of so-called Virginian tobacco the process is somewhat different; to secure the greatest amount of light-coloured leaf the planter must for the first few days during the yellowing process prevent curing, by keeping the atmosphere humid, till the tobacco is properly yellow; then the curing process is commenced and is continued constantly to prevent "running" till the tobacco is thoroughly dried. The relative amount of humidity and heat necessary both during the yellowing period and the curing period are highly important, as the results obtained depend largely on these factors.

The ageing or fermenting process should not be attempted by the farmer where a warehouse is available, as it is purely a warehouse operation, and can only be done properly where large quantities of tobacco are brought together and where suitable buildings are available.

Chemical Changes.—During the growing period there are certain plant foods which become water soluble and are drawn into the plant by means of fine root hairs on the plant. These plant foods—nitrogen, potash, and phosphorus, in addition to certain other minerals such as lime, magnesium, sulphur, iron, and carbon—are essential in building up the cell structure of the plant. During the growth, curing, and fermentation of a crop of tobacco there are complex chemical changes constantly going on; starches are converted to sugar, alkaloidal poisons are built up and broken down, nitrogen is probably used up in this process and again liberated in the fermentation process. This continuous chemical change is illustrated by the varying amounts of nicotine found in tobacco at different stages. Generally speaking, as a plant develops, there is a gradual increase in the nicotine. Seedlings at transplanting time will show approximately .25 per cent. of nicotine, and at full maturity the plant may show 4 per cent. of nicotine; if allowed to stand longer in the field and become over-ripe it will show a slight falling in the nicotine content. Likewise, during the fermentation process, there is a reduction in the nicotine content.

If one follows these changes, we see starch form and disappear, sugar form and disappear, nitrates and nicotine increase and again decrease. Citric, oxalic, and

malic acids are present in the growing plants, and these partially disappear in the cured leaf. Butyric and acetic acids are present in fermented leaf. During the fermentation process gases are formed by the breaking down of certain compounds; ammonia is one of these gases, which is easily detected by the odour in the fermenting room. Thus it is apparent that after a crop of tobacco reaches the curing-shed it is highly important that the curing and fermenting be carried out with the greatest care in order that the best qualities may be obtained.

Fertility of Soil.—The question of the fertility of the soil is one which, though often discussed, is of such importance that I feel justified in making a few comments on it before closing. I would first like to impress the fact that the quantity of plant food in the agricultural zone of the soil is a definite quantity, and every crop grown on that soil takes away a portion of that definite quantity. So it becomes a simple matter of reasoning, that if one continues to draw on that stock of plant food without replacing it by means of fertilisers or by growing deep-rooted manuring crops, he must expect in a few years to see a falling off in yields. Again, constant cropping without ploughing under manuring crops will reduce the humus or decaying vegetable matter in the soil to such an extent that, although there may be sufficient nitrogen, potash, and phosphorus to produce crops, the soil may be lifeless. This decaying vegetable matter acts like a sponge in holding moisture in the soil and also provides a habitat for the soil bacteria, which is so essential to plant life.

Tobacco, which is sometimes spoken of as a potash plant, requires a fair amount of plant food; therefore, if a soil is not giving good yields, for lack of plant food, it is probably advisable to apply a complete fertiliser carrying, say, 4 per cent. of potash, 3 per cent. of nitrogen, and 8 or 10 per cent. phosphoric oxide. I would, however, advise caution in the use of nitrogen, especially in attempting to produce yellow tobacco. Nitrogen has a tendency to produce a stronger, heavier, and darker tobacco. Potash should not be used for tobacco in the form of a chloride, as chlorine is generally conceded to be injurious to the burning quality of tobacco. Phosphoric oxide seem to give an earlier maturity and a lighter-coloured leaf. Previously we mentioned the Blue Grass Region of Kentucky as the favourite home of the White Burley tobacco. Underlying this area is a stratum of limestone, and the surface soil contains decomposed limestone, and incidentally this soil shows a high percentage of available phosphoric oxide. It is probably the phosphorus or the combination of phosphorus and lime together with a temperate heat that makes this section ideal for the production of this particular type of tobacco.

RICE-GROWING.

By A. J. BOYD.

Having seen rice growing in Java and some other tropical countries, it struck me that the soils and climate of Queensland would be just as suitable for the successful cultivation of this cereal in Queensland. I therefore obtained some "paddy" (rice seed) and sowed it on my sugar plantation Ormeau, at Pimpama, in 1869. It throve splendidly. The seed was one of the Japan varieties. Since that time, from the seed thus raised and distributed, other settlers took the matter up, and it was not long before about 300 acres were under the crop. In 1901 Mr. F. W. Peek, of Loganholme, wrote in the December issue of the "Q. A. Journal," an exhaustive account of the initiation, rise, and progress of the rice industry, giving full directions for sowing, cultivating, harvesting, and threshing out the grain, milling the rice, and preparing the crop for market. In the year mentioned the Brisbane "Observer" wrote as follows concerning a sample of rice grown on Pimpama Island:—"The rice resembles Patna rice in shape of grain, but is of darker colour. Qualified experts, to whom it was shown, said it was the first really high-grade rice they had seen grown in this State, and as it could be marketed (in 1869) at from £18 to £18 10s., it commanded a ready sale. The commonest quality of imported rice, Rangoon, was then selling at £19, duty paid, while for Japan rice £24, duty paid, was asked by the distributing houses. There is no more trouble in sowing and harvesting a rice crop (Upland Rice) than in the case of a wheat crop."

Like every other cereal or vegetable, rice, to ensure good results, must have a certain amount of attention and care in preparing the land, although the question of drainage does not enter so largely into consideration for this crop as for other cereals. Stagnant water should be avoided as detrimental. I do not here deal with swamp rice, which is raised in seed beds, planted out in wet land, and inundated at

intervals almost up to the ear. Such rice can only be profitably grown in countries like Java, China, and other countries where there is an abundance of cheap coloured labour. The so-called Upland rice is raised without transplanting, and with no more irrigation than is required for wheat, barley, or oats. The variety successfully grown in the Logan district and at Cairns in the far North was the "White Java," which gives a length of straw of from 4 to 6 feet, with a good flag, besides a grain of good length, fairly plump, and the variety is also free from disease or rust.

"In preparing the land," said Mr. Peek in his paper on rice-growing, "ordinary methods only need be adopted—that is, to first plough, leaving the soil to lie for a week or so to aerate and sweeten. Then, cross-plough and harrow, bringing the soil to as fine a tilth as possible. The best time for planting in Southern Queensland (south of Rockhampton) is at the end of September or the beginning of October, when we get the first rains. In cultivating for rice on hillsides or sloping land with a natural rapid drainage, it would be advantageous to slightly terrace the land cross-ways to the fall of the hill, leaving an open catchment drain on the higher side, and blocked at each end to conserve the rain water, because even so-called Upland rice must have a certain amount of moisture, and by the construction of the above drain, or dam, so to speak, the gradual percolation of the conserved water will have the desired effect of helping to supply the necessary moisture, which would be about 20 to 30 inches of rainfall spread over the period of growth. This amount of rainfall has produced very good crops of grain. Now, about sowing the seed: We have to be determined in the matter by our requirements—if for cropping for grain, or for fodder purposes only. There are three systems: Broadcast, chiefly for fodder purposes; planting in drills; and transplanting from nursery beds. In the first instance—*i.e.*, sowing broadcast—it will take a bushel (60 lb. of paddy) to the acre, the seed being harrowed and treated in the same manner as for oats or wheat in the after cultivation. But the plan most generally adopted, and by far the best, is planting the rice in drills 2 feet 6 inches or 3 feet apart, and about 10 to 12 inches between the plants, which may be done successfully with an automatic seeder. By this method, about 35 to 40 lb. of seed to the acre are required. It ensures the crop being more even and not so patchy as when sown broadcast, and allows a better chance of going through the crop with hoe or cultivator to remove any weeds that may have made their appearance before the rice has got fairly started.

We need not describe the methods adopted to raise a crop of swamp rice, as it is very unlikely that this variety of cereal will ever find favour in a White Australia. One might as well try to transplant a field of oats or wheat and expect to get a profit.

The usual method pursued in harvesting rice is to cut with the ordinary sickle or reaping-hook, although where large areas are planted it is thought that the latest wheat-harvesting machinery could be used effectively.

The time for harvesting is whilst the stalks have still a bronze-green appearance, and the heads have turned a golden brown about half-way down and appear what a wheat farmer, or an inexperienced person, would call three parts ripe.

As many as thirty or forty heads have been produced from a single grain planted, the product weighing from 10 to 14 oz. By cutting rice at this stage, the loss by shedding is not so great as with over-ripe grain. Rice is never left stooked in the field, but is treated as quickly as possible.

After threshing, a great deal of nutriment remains in the stalk, which makes excellent stock food and also good ensilage.

The market for rice in Australia is a growing one, and it will take years before the supply overtakes the demand. Our farmers need not fear to grow this crop and invest in the industry, which will return a fair amount of profit for the labour and outlay required to produce an article which only requires care in selecting and planting the varieties to suit the market requirements.

The machinery needed for hulling and polishing the grain is comparatively inexpensive.

Messrs. Whitmore and Binyon, Limited, Mark Lane, London, are makers of rice mills ranging in hourly output of hulled and pearled rice from 7½ cwt. to 20 tons per hour.

Some years ago, Mr. W. Heck, a sugar planter on Pimpama Island, imported a little rice mill, capable of treating half a ton of dressed rice per day, as an adjunct to his sugar mill. With this machine he turned out a finished, polished product which was pronounced by Brisbane merchants to be equal to any imported rice of the same variety, and very little different to the best Japanese rice.

The rice crop in 1898 in Queensland covered 863 acres, and averaged 44.19 bushels per acre, the total yield amounting to 38,133 bushels of 60 lb. To-day it is one of the neglected industries, yet we import annually over 2,000 tons, for which we pay—for Patna and Japanese rice, £60 per ton. Chinese rice is imported in mats containing from 49 to 50 lb. each, for which importers pay from 18s. 6d. to 20s. per mat, or about £37 to £40 per ton.

As the cultivation of rice is practically the same as that for wheat, any wheat-grower can calculate for himself the cost of production and harvesting of paddy, and can thus judge whether it is a crop which will return him more than, or at least as much as, wheat or maize. Of course, the cost of threshing, hulling, and polishing must be taken into consideration. We understand that early in this year nine bales of paddy (rice for seeding purposes) were received from Japan for shipment to intending growers in the Cairns district.

SISAL HEMP IN JAMAICA.

A few years ago sisal hemp was produced to some extent in Queensland, and it proved a very profitable crop, but, eventually, the increase in wages, the higher cost of machinery, and the rise in freights, coupled with the hopeless competition with cheap coloured labour countries, the industry declined to a vanishing point. The East African sisal industry has suffered enormously through the abnormal conditions resulting from exchange difficulties. The results of trading during 1920 must have been to growers, shippers, and merchants most unsatisfactory. While prices for the first six months of the year were satisfactory, the subsequent drop during the rest of the year, combined with the heavy allowances for damaged hemp, and also for tow being shipped, instead of hemp, must have caused serious losses. British-grown sisal, best quality, is quoted by Messrs. Landauer and Co. at £51 to £52 per ton, and No. 2 at £46 to £48. Yet German sisal, which leaves much to be desired in quality, colour, and selection, is valued at from £53 to £54 for No. 1, and £47 to £48 for No. 2. Tow is quoted at £30 to £32, according to quality.

The Director of Agriculture, Jamaica, Mr. H. H. Cousins, made the following report in November last on the result of testing the second crop of fibre from the experimental 1,000 plants at Lititz of the sisal of the 1915 planting, cut in November last:—

TESTS OF FIBRE YIELDS AT LITITZ.

	Cut Nov., 1919.	Cut Nov., 1920.
Average number of leaves fit to be cut per plant	32	30
Average yield of leaves in lb. per plant ..	19	18
Average weight of single leaf	9.6 oz.	9.7 oz
Recovery of fibre (by hand) per cent.	3.4	3.93
Fibre per 1,000 plants, lb.	646	759
Yield per acre of fibre (6 x 5) at normal distance of 6 feet x 5 feet	938	1,029
Total	2 cuttings, 1,967 lb.	

These results are quite encouraging, as the drought at Lititz in 1920 has been very severe and the experimental site is considered to be the most infertile area on the whole of the Lititz Savannah.

While the leaves average slightly more in weight than last year, the percentage af fibre has increased from 3.4 to 3.93 and the gross return of fibre is now indicated to be at the rate of 1,079 lb. of fibre per acre, as against 938 lb. per acre for 1919 for the first crop.

In less than a year we have thus obtained from this test area 1,967 lb. of fibre per acre worth about £40 in London to-day. We should get four crops before the plants are exhausted so as to get about 4,000 lb. of fibre per acre before replanting becomes necessary.

It is therefore evident that the growing of sisal for fibre at Lititz should be a profitable undertaking.—"Journal of the Jamaica Agricultural Society," January, 1921.

Botany.

A WILD COTTON.*

By C. T. WHITE, F.L.S., Government Botanist.

Writing under date 10th December, 1920, to the Minister for Agriculture (Hon. W. N. Gillies), Mr. F. Pether stated:—"I enclose for your inspection a sample of wild cotton found by me growing on poor sandstone hills near the Mayne River. The cotton bush only grows a foot high, but the whole of it is nearly all cotton and is easily stripped from the stem, which bears only a few soft leaves."

The sample sent was a very small one and insufficient for botanical identification other than it showed it to come from some plant of the family Chenopodiaceæ or Salsolaceæ, a family containing the Salt Bushes and Goosefoots.

Mr. Daniel Jones, who examined the specimen, reported that "It was the first example of a native fibre approaching true cotton he had seen, but that, owing to its short staple, its commercial value would not be much, although it might be used as a substitute for kapok." It is not likely, however, that it would pay to collect for this purpose, as kapoks are available from a number of more readily available sources.

Later (14th January, 1921), Mr. Pether forwarded complete specimens of the plant, with the following accompanying notes:—"The sample now being forwarded is what I pulled from the ground just as it was growing. As you will see, the root was broken in the pulling. The fibre forms in the shape of a flower with a tiny seed in the centre. The sample which I have now forwarded was just on the turn of ripening. The tip of the plant was green. The cotton ripens from the bottom of the stem upwards and falls away as it ripens. I first discovered the plant in September, 1920, after there had been good winter rain. As far as my knowledge of the plant goes, I should think it would reach maturity in three months, but so long as the ground kept moist, it would keep green, as it appears to grow and ripen much the same as the natural grasses. It grows where the natural grasses would not grow, the land being too poor for them. The nature of the land on which it grows is nearly sandstone rock, or perhaps better described as sand which has crumbled with age from a sandstone rocky hill. This sandy soil also bears a small quantity of ironstone. There is no doubt about the plant being hardy, and I should think very little rain would keep it going. I have only been to the cotton patch once or twice. It was then ripe, and had mostly all fallen from the stalk, but still having a small quantity hanging from the plant, the fibre lying on the ground in heaps. The country in the vicinity of which this plant is growing is very poor sandstone country, and this one patch of cotton is the only one that I know of. I have also shown it to old hands, but no one has ever seen the plant growing. I showed it to Mr. Murray, manager of Brighton Downs Station, on the Diamantina, who is a very old identity here, and who has been all over this country; but he had not seen it before; therefore, I think this is probably the only patch where it grows in the district. The locality is roughly about twenty-six miles east of the junction of the Mayne and Diamantina Rivers."

On examination, the specimen proved to be a species of *Bassia,* and one apparently new to science. Strange to say, the nearest ally of Mr. Pether's plant is *Bassia carnosa,* a species only known to occur in a few coastal localities in Western Australia. The Queensland plant very closely resembles the Western Australian one, but the cotton surrounding the seed is considerably longer. A description and illustration is given herewith.

BASSIA LANUGINOSA, sp. nov.

Fruticulus erectus ca. 30 cm. altus; ramis dense lanuginosis; foliis sericeo-tomentosis sessilibus linearibus ca. 2.5 cm. longis 2 mm. latis vel superioribus subovatis ca. .9—1.1 cm. longis et 3.5 mm. latis; floribus axillaribus solitariis pilis albis longis obsitis, stigmatibus 2; perianthio fructifero depresso, pericarpio depresso-ovoideo membranaceo pilis paucis longis obsitis.

A small undershrub about a foot high with numerous erect simple stems arising from a hard branching woody base. Stems covered with a dense, long, floccose

* As this article describes a new plant, it is necessarily somewhat technical. A brief Latin diagnosis is included in accordance with the International rules of botanical nomenclature.

PLATE 24.—A "WILD COTTON," (*Bassia lanuginosa*). Slightly reduced.

tomentum. Leaves sessile, linear or the uppermost ones more or less ovate, lower ones about 1 inch (2.5 cm.) long, about 1 line (2 mm.) broad, uppermost ones 4 to 5 lines long (.9—1.1) and 1½ to 2 lines (3-5 mm.) broad, densely covered with long silky or cottony hairs. Flowers sessile and solitary in each axil, but crowded along the upper part of the stem, densely enveloped in long white silky-woolly hairs. Fruiting perianth depressed; about 2 lines in diameter without the wool, but over 1 inch in diameter with the wool teased out, the 5 lobes closing over the fruit and surrounded by a slightly raised horizontal ridge, but without appendages of any sort. Stamens 5, styles 2, united to about the middle. Pericarp, about 1 line in diameter, depressed-ovoid, membranous with a few long hairs.

Habitat.—Sandstone country about twenty-six miles east of the junction of the Mayne and Diamantina Rivers, Western Queensland, *Frank Pether.*

The nearest ally of this new species is *Bassia carnosa*, a Western Australian species, from which it can be distinguished as follows:—

Leaves at length glabrous; flowers in terminal leafy spikes; fruiting perianth 1 line in diameter without the wool, including the wool about 3 lines .....*B. carnosa.*

Leaves never glabrous, flowers not collected in definite terminal spikes, but occupying the whole of the upper part of the stem, sometimes almost the entire stem, fruiting perianth 2 lines in diameter without the wool, about 1 inch, including the wool teased out.....*B. lanuginosa.*

Notes on the Genus Bassia.—The genus Bassia comprised about 40 species, found in Southern Europe, Northern Africa, and temperate Asia, but finding its greatest development in the drier parts of Australia. The fruits of many are more or less spiny and covered with down or short woolly hairs. The genus was founded by the Italian botanist Allioni in 1776 on *B. muricata*, a Southern European species. In the "Flora Australiensis" the genus is divided into three smaller ones, *e.g., Chenolea, Aniscantha,* and *Sclerolaena.*

These are separated by only small differences, and none have priority over Bassia as a name. In 1771 the German botanist Koenig established a genus called *Bassia* on an East Indian tree, and in many works Koenig's genus stands for a number of tropical trees of the family Sapotaceæ. Most modern writers, however, now generally accept Allioni's genus as having priority, and the Sapotaceous one was changed by Baron von Mueller to *Illipe,* which latter name is now generally held.

These notes are necessary to explain the departure from the nomenclature in the "Flora Australiensis" and Bailey's "Queensland Flora."

TO MAKE CHARCOAL.

In the early days of the Chiltern goldfield, Victoria, there was a great demand for charcoal by the smiths, who had hundreds of miners' picks to sharpen. The only supply at first was obtained from charred logs, but several Italians went into the business, amongst them being men who had been charcoal-burners in their own country. Their mode of procedure was as follows:—

The principal timber trees were stringy-bark, and these men felled the trees and stripped off sheets of bark, which sold for 2s. 6d. per sheet for roofing the houses of the incipient township. They then split up the logs into lengths of from 3 to 6 feet. A stout post was placed upright on the site selected for a charcoal kiln, and small wood gradually extending to the longest billets was built up against it in the shape of a beehive. This was covered with grass, and about a foot thick of dry earth thrown over the grass. Small openings were left here and there on the ground floor to create a draught. Then the post was lifted out, and fire dropped into the chimney so produced. From this time forward a watch was kept night and day on the pile, and at any sign of fire breaking through, fresh earth was piled on. Some of these kilns would produce from 20 to 50 bags of charcoal. In about 36 hours the pile of burning timber began to subside, and eventually buckets of water were poured down from the top to extinguish the fire. On opening up the kiln the whole mass of timber was reduced to charcoal, which was spread out to cool on a cleared space, the lumps of charcoal being carefully separated, for wherever any of it happened to be still red hot it would communicate the fire to the rest, which would, in the open air, be reduced to ashes. The charcoal found ready sale at 2s. 6d. per bag. A community of Italians would sometimes have half a dozen of their kilns in operation at the same time.

Forestry.

QUEENSLAND TREES.

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Government Botanist.

No. 2.

GIANT WATER GUM (*Eugenia Francisii*).

Common Name.—Giant Water Gum.

Derivation.—*Eugenia,* in honour of Prince Eugene of Savoy, an early protector and encourager of botany; *Francisii,* after William Douglas Francis.

Description.—A very large tree attaining 130 feet in height and a barrel diameter of 5 feet. Barrel mostly very widely and prominently flanged at the base. Bark brown or grey, smooth or with occasional partly detached fairly long flakes; when cut, brown, measuring ⅜-inch thick on a tree with a barrel diameter of 3 feet 6 inches. Sapwood white. Leaf stalks about ½-inch long. Leaves opposite, somewhat egg-shaped or elliptical in outline, drawn out into a prominent point at the apex, upper surface dark green and glossy, underside paler, midrib and the numerous fine lateral nerves visible on both surfaces; measurement of leaf blade, 1½ to 3 inches long, twice to 2½ times as long as broad. Minute transparent dots (oil cells) are seen in the leaves of this and allied species when they are held between the eye and a strong light. Flowers in panicles at the ends of the branchlets and proceeding from the forks of the leaves. Stem and branches of panicles slender and often 4-angled. The flowers are borne at the end of the panicles branches in little clusters of 3 to 6. The individual flowers are very small, measuring less than ½-inch long and are borne on a slender stalk of about one-tenth of an inch. The calyx and tube which forms the lowermost part of the flower is bell-shaped and bears 4 short, broad teeth at its rim. Within the calyx teeth are 4 round, yellowish petals about one-tenth of an inch in diameter. Within the ring of petals are numerous fine stamens about one-sixth of an inch long. The ovary fills the lower part of the calyx tube, and is surmounted by a style about as long as the stamens. Fruit bluish purple, often paler, round and somewhat flattened, nearly ¾-inch in diameter and ½-inch in depth, consisting of a mealy pulp surrounding a comparatively large seed.

Distribution.—Coastal scrubs of Eastern Australia from the Richmond River, N.S.W., to Gympie, Queensland. It is a very common tree in the scrubs eastward of Gympie, and is frequent along watercourses and on damp flats. Confined to Australia.

Uses.—The close-grained, pinkish timber has not been used so far as we know. It is easily worked, and could at least be used for cases.

Remarks.—The name "Water Gum" originated from the fact that quantities of a watery sap are sometimes contained in a central cavity or pipe of the barrel, and it flows out when the trees are being felled. We have called it Giant Water Gum to distinguish it from other smaller and hard-wooded trees, also called "Water Gums" in Queensland.

References.—*Eugenia Francisii,* F. M. Bailey, "Queensland Agricultural Journal" vol. 26, page 315, pl. 31 (1911). We are unable to separate this species from *Eugenia Tomlinsii,* Maiden and Betche, "Proceedings of the Linnean Society of New South Wales" vol. 27, page 247 (1913), and have taken this view in giving the distribution of the tree.

Photo. by the authors.]

PLATE 24.—GIANT WATER GUM (*Eugenia Francisii*). Kin Kin.
Three men, two on horseback and one on foot, may be seen near the base of the tree.

Plate 25.—Giant Water Gum (*Eugenia Francisii*).

A. Branchlet showing inflorescence.
B. Branchlet showing very young fruit.
C. Inflorescence.
D. Branchlet from barren shoot, showing underside of leaves.

Entomology.

CANE GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon Cane Grub Investigation from Dr. J. F. Illingworth, the Entomologist to the Bureau:—

Rains have continued during the past month, so that the soil is now (15th March) thoroughly saturated and all the watercourses are flooded bank high. Between showers the weather has been exceedingly oppressive; hence, conditions could hardly have been better for the growing crops. Fortunately, too, these tropical disturbances have not developed much wind, so most of the cane is standing well. Babinda district, as usual, has come in for her full share of the deluge—an average of about an inch per day for the months of January, February, and March—yet the cane there is making splendid growth.

Grub injury is beginning to show at Greenhills; and arsenic where used in sufficient amount, is already showing encouraging results.

DEVELOPMENT OF LEPIDODERMA ALBOHIRTUM.

This species, as usual, has developed very rapidly in the red-volcanic soils. Digging in the fields at Greenhills, on 11th March, showed that 73 per cent. of the grubs had already reached the third stage, which is the period in their development when they are most destructive; 26 per cent. were in the second stage, and only about 1 per cent. still remained in the first stage. Since straggling beetles were on the wing up to about the middle of February, the duration of the first and second stages is apparently something less than a month each. The final stage, on the other hand, remains with us right up to cold weather, and even then the grubs frequently continue for several months deeper in the soil in their hibernating chambers.

In spite of the super-saturation of the soil, much of the cane at Greenhills already looks as if it were suffering from extreme drought—*i.e.*, the terminal leaves are rolling, giving the characteristic piping appearance, and the beautiful dark-portions of the stalks badly gnawed. During the prevailing wet weather the grubs are particularly abundant, the leaves have become almost dry and brown in colour. Stools of cane in this condition can easily be lifted right out of the ground with one hand, for the roots have been eaten entirely away and even the underground portions of the stalks badly gnawed. During the prevailing wet weather the grubs are just under the surface of the soil and near the cane, so that when the stools are pulled out bodily most of the grubs are disclosed. These vary in numbers considerably in different parts of the field, chiefly with regard to the distance to the feeding trees, but it is not at all uncommon to find twenty to fifty in a single stool, especially in the ratoon cane.

ARSENIC FOR CONTROL OF CANE GRUBS.

Most of the plant cane on the Greenhills Estate was treated with arsenic at the time of planting, the poison being placed in the drill at the rate of about 80 lb. per acre. This cane has made excellent growth, except in a few places on the rising ground, where grub-injury is already showing.

In our two experimental fields on this estate we have forty-six plots, each having a width of five rows (25 ft.). Right through, the treated plots alternate with checks, so that we may get a better line on the real effect of the poison. As was noted almost a year ago, we used arsenic in the following amounts per acre: 40 lb., 80 lb., 100 lb., and 200 lb. One field was planted to D. 1135 and the other to Badila. The first was planted in April, 1920, so that there is fully 7 ft. of cane on it. The poisoned areas were treated during May, 1920, when the cane was almost a foot high, but before the drills were filled. This field has always been one to show grub-injury first, so, as usual, much of the cane is already (15th March) suffering there. Most of the checks have fallen, due to the excessive wet weather, while the treated plots show varying degrees of immunity. On 11th March, I was much interested to find the cane in the plot treated with arsenic at the rate of 200 lb. per acre standing erect, while the check plots at either side and at the end had fallen. It was good enough for a picture, for this standing cane had made excellent growth,

far ahead of that in the checks. Five rows away on one side was cane treated with arsenic at the rate of 100 lb., which was somewhat fallen; and the plot with 80 lb. of arsenic, on the other side, was not quite as good. Sixty lb. of arsenic showed some value, though the cane in the checks had not fallen so badly in that part of the field and the results were not so apparent. The plots treated with 40 lb. of the poison hardly show any results so far. The injury has not developed far enough in our Badila field for results upon the appearance of the cane. Digging, however, showed that there were fully 50 per cent. less grubs in the treated plots than in the checks, and, furthermore, the grubs were not so far developed. We found about 73 per cent. of the grubs in the checks had reached the third stage, while practically none had gotten to that stage where the heavier doses of arsenic had been applied. It will probably be interesting to have the following exact figures of the number of grubs that we found during our examinations:—

24th February, 1921—

Field D. 1135, check, 3 Stage I., 29 Stage II., and 13 Stage III., or a total of 45.

Plot treated with 200 lb. arsenic, 1 Stage I., 4 Stage II., or a total of 5; and 4 dead second-stage grubs were found, that had just succumbed to the poison.

The next check plot had 2 Stage I., 12 Stage II., and 4 Stage III., or a total of 18.

A stool in a plot treated with 100 lb. arsenic gave 1 Stage I., 8 Stage II., or a total of 9; and one dead of arsenic.

The plot treated with 80 lb. gave 2 Stage I., 4 Stage II., and 1 Stage III., or a total of 7; and 1 dead of arsenic.

The check gave 2 Stage I., 6 Stage II., and 10 Stage III., or a total of 18.

A plot treated with 60 lb. of the poison gave 1 Stage I., 6 Stage II., and 1 Stage III.

Where 40 lb. of arsenic had been applied we found 6 Stage II., and 4 Stage III., or a total of 10 grubs.

From the above figures it would appear that most of the grubs are destroyed by the poison during the second stage, just before they reach the very destructive period in their development. The dead grubs only last a few days in the soil before disintegrating, which accounts for finding so few dead in the soil.

It is too soon to offer conclusive remarks on how much arsenic is necessary for complete control of this pest, or which method of application is best; nevertheless, the results are encouraging.

WHITE GRUBS DESTRUCTIVE TO GRASS PADDOCKS AT ATHERTON.

A species which resembles very closely our cane grubs has been doing rather serious damage to grass lands in the vicinity of Atherton. Mr. Dodd recently did some investigating in this district, and found the grubs very near the surface, where they were destroying the roots of the grass, but fortunately in rather localised areas. I have been able to secure specimens of the beetles of this species through the kindness of Mr. Wilson, of the Babinda Mill staff, who was on the Tableland during their flight, and was thoughtful in securing specimens for us.

These beetles are different from anything that we have in our collections, so are evidently a localised species. It may be remarked, however, that this is a pest which might easily become very important, especially on crops like corn, if not repressed in some way.

TO PICKLE CHILLIES.

Take large, green capsicums, and slit them sufficiently to remove the seeds. Then make a brine of salt and water of sufficient density to float an egg. Place the chillies in this when the brine is cold, and let them remain there for twenty-four hours. Then drain again, rinsing in cold water. Then place in wide-mouthed stone or glass jars. Now take vinegar and water in the proportion of one quart of vinegar and one quart of water to every thirty chillies. Heat to boiling point and pour it over the peppers in the jars. Leave it to stand till cold; then drain off the vinegar and water and throw it away. Now heat fresh vinegar without water and pour it over the peppers boiling hot. Cover the jars tightly and set in a cool place.

General Notes.

SOIL ALKALI: ITS ORIGIN, NATURE, AND TREATMENT.

By F. S. HARRIS, Ph.D., Director and Agronomist of the Utah Agricultural Experiment Station.

One of the most serious problems confronting the farmer of arid and semi-arid regions, more particularly in those where irrigation is practised, is the prevention of accumulation of soluble salts in the soil, which in excessive amounts act as plant poisons. The name "Soil alkali" is not restricted to substances having strong basic reaction, but is popularly used for the designation of all soluble salts in the soil which may be injurious to plant life.

A very large amount of literature has been published during the past years on the question of "Soil alkali," but the author is the first to condense this work in text-book form.

The origin of alkali, the nature of injury to plants and seeds, toxic limits, native vegetation indicative of alkali, chemical method of determination of alkali, relation of alkali to physical and biological condition of soil, methods of reclaiming alkali lands, crops suitable for such lands, drainage, alkali irrigation water, &c., &c., are dealt with in the many chapters, the author utilising the numerous fundamental facts collected in all parts of the world, giving the references at the end of each chapter.

His own personal experiences in the treatment of alkali lands make the work particularly valuable to anyone interested in this problem, which affects Australia as much as any other part of the world.

IMPORTANCE OF LIME FOR THE SOIL.

When a soil is found to be deficient in carbonate of lime the remedy is simple. So common is the want of lime that the recommendation to apply it is the most obvious remedy which occurs to any practical agriculturist or agricultural chemist. If a soil is sour; if it is newly broken up from pasture or waste; if it has been reclaimed from a boggy condition; if it is worn out by exhaustive cropping; if pastures or meadow land exhibit coarseness of herbage; if land is addicted to "finger and toe"; if potatoes are rough-skinned or scabby, or if a field produces stunted or diseased herbage, the first suggestion is to lime it.—"Garden and Field."

SULPHUR AS A FERTILISER.

Of recent years a number of tests and experiments have been carried out in the United States of America in the use of sulphur as a fertiliser for lucerne fields.

From the reports that have come to hand, it is gathered these have been very successful. For instance, in eastern Oregon nearly six times as much alsike clover hay has been secured from paddocks treated with sulphur at the rate of 100 lb. to the acre, as compared with untreated areas. In the same district a single application of 100 lb. sulphur increased the yield of lucerne on an average 1½ tons per acre for four years. Of course, Australian soil and climate conditions are different from those obtaining in America, but it should be worth somebody's while to make a few tests in this country.

THE SUFFOLK HORSE.

The soundness of the Suffolk horse was indicated in the recent report of the Ministry of Agriculture in England on stallions for which licenses were applied.

This point was specially referred to at the meeting of the council of the society. Attention was drawn to the fact that only 5 per cent. of the stallions were rejected as unsound, and only two animals had side-bone. The faith which breeders of Suffolk horses have in the Punch prompted them to accept without demur the proposal of the breeding scheme committee that at the three sales of pedigree Suffolk horses to be held by the society in March, July, and September next every animal except foals must be sold sound. It was agreed that this proposal meant a bold step, but the members of the council unanimously declared they were prepared to take it.—"Queensland Grazier," 17th March.

CANNED FRUIT SHIPMENTS.

To save the fair name of Australia being dragged in the mire by unscrupulous dealers, and to avert any further cause for complaint by oversea purchasers of Australian canned fruits that such were badly packed or arrived in a condition detrimental to the Australian fruit export industry, the Customs Department, South Australia, will, we understand, next fruit season, adopt a system of inspection at factories, and see that consignments for export are properly graded, canned, and cased, and generally are in accord with a standard adopted by the department. All fair minded fruitgrowers, packers, and exporters, who have the welfare of the Australian fruit industry at heart, will (says "Garden and Field") agree that action in the direction indicated is right and proper.

The Queensland Government some time ago took the same action, with the result that the canned pines for export are pronounced to be equal to any packed in other countries.

PRICES OF RUBBER.

Messrs. Leslie and Anderson, in their market report issued on 27th January last, remark that the market for rubber had been dull during that month, with a declining tendency in prices which showed a fall of 2¼d. to 2¾d. per lb. in ribbed smoked sheet which then stood at a discount of 2½d. to 3d. on Crepe. They quoted standard smoked sheet 9¾d. per lb. London stocks then totalled nearly 55,000 tons. "The Planters' Chronicle," Madras (26th February), states that restriction of output was agreed upon during the latter part of the year, to continue to the end of 1921.

QUEENSLAND FELIX.

If the rest of the world only knew what a bright, happy State this is, how glorious our climate, how fertile our fields, and how diversified our products, Queensland would be so packed with home-seekers that there would not be a spot to loaf on. Home-seekers are what we want, and we are glad to welcome them. We don't want lazy adventurers who cannot make a success of life anywhere, but the hard-working farmer with a little capital, the hard-working farm labourer with his strength and his brains for his capital. These are what we want to build up our State, and it is pleasant to know that they are coming to us in increasing numbers.

THE LARGEST STATION IN AUSTRALIA.

In reply to a correspondent from North Queensland, the "Pastoral Review" (Melbourne) writes:—"Notwithstanding what other papers may have published, the area of Victoria River Downs, N.T., is 11,561 square miles, all connected and under the one manager, and made up of ten leases and two permits. The owners of the property have supplied us with the exact figures for each lease, and we hold their signature as to the accuracy of same. The areas of each block are as follows:—Block 2,184, 8,746 miles; block 2,158, 336 miles; block 2,182, 147 miles; block 2,157, 96 miles; block 253 (permit), 83 miles; block 279 (permit), 98 miles; block 2,183, 240 miles; block 2,174, 327 miles; block 2,159, 249 miles; block 2,175, 388 miles; block 2,180, 353 miles; block 2,181 miles, 498 miles. Total, 11,561 square miles."

THE BUTTERMAN.

We've reached another stage of life,
When failing years are born anew;
This lovely year has seen no strife,
And peacefully departs from view.
A sunny summer filled with fruit,
An autumn crowned with golden lore,
A richer year beyond dispute
Than many that have gone before.
Bountiful year, adieu, farewell,
Go home and tell your Father how
We thank Him more than tongue can tell,
And pray Him still, "God speed the plough."
To patrons, readers, far and near,
And dairymaids throughout the lan',
We wish you all a bright New Year,
Most truly yours, "The Butterman."

Answers to Correspondents.

COTTON SEED.

"S.C.," Marwood, Mackay.—

The request for a supply of cotton seed has received attention. Copy of cotton pamphlet has also been forwarded to Mrs. Ditton and yourself.

COBBLER'S WAX.

Some time ago a correspondent asked us how to make "Black Wax." We could get no information on the subject from anyone in the boot trade. We find a recipe in "The Land" for making cobbler's wax, which may possibly have been the material in view:—Melt together ½ lb. white wax, 1 lb. hard soap, 1 oz. ivory black, and a quarter pint of linseed oil. Dissolve over a slow fire, stir until cool, and turn into small moulds.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR APRIL, 1921.

Article.		APRIL. Prices.
Bacon, Wholesale	lb.	1s. 3d. to 1s. 4d.
Bacon, Retail	„	1s. 5d. to 1s. 6d.
Barley	bush.	...
Bran	ton	£9 10s.
Broom Millet	„	£24 to £29
Broom Millet (Sydney)	„	£30 to £40
Butter (First Grade)	cwt.	196s.
Chaff, Mixed	ton	£5 10s. to £7 10s.
Chaff, Oaten	„	£5 to £8
Chaff, Lucerne	„	£6 10s. to £9 5s.
Chaff, Wheaten	„	£5 5s to £7
Cheese	lb.	1s. to 1s. 0½d.
Flour	ton	£19 10s.
Hams, Retail	lb.	1s. 4d. to 1s. 9d.
Hams, Wholesale	„	1s. 3d. to 1s. 4d.
Hay, Lucerne	ton	£6 to £7
Hay, Oaten	„	...
Honey	lb.	4d. to 4¾d
Maize	bush.	4s. 4d. to 4s. 5d.
Oats	„	3s. 6d.
Onions	ton	£4 to £8
Peanuts	lb.	3d. to 6d.
Pollard	ton	£10
Potatoes	„	£6 to £9 5s.
Potatoes (Sweet)	cwt.	2s. to 4s.
Pumpkins (Cattle)	ton	£3 to £4 10s.
Eggs	doz.	2s. 1d. to 3s. 1d.
Fowls	per pair	4s. to 7s.
Ducks, English	„	4s. to 6s. 6d.
Ducks, Muscovy	„	5s. to 7s. 6d.
Geese	„	10s. to 12s.
Turkeys (Hens)	„	9s. to 10s.
Turkeys (Gobblers)	„	17s. to 21s.
Wheat	bush.	5s. 7d. to 6s. 6d.

VEGETABLES—TURBOT STREET MARKETS.

Asparagus, per dozen bundles	...
Beans, per sugar bag	4s. to 8s. 6d.
Beetroot, per dozen bunches	1s. to 1s. 7d.
Cabbages, per dozen	4s. to 13s. 6d.
Carrots, per dozen bunches	1s. to 1s. 6d.
Chocos, per quarter case	1s. 6d. to 3s. 6d.
Cucumbers, per dozen	1s. to 1s. 6d.
Lettuce, per dozen	6d. to 1s.
Marrows, per dozen	1s. 3d. to 4s.
Parsnips, per dozen bunches	...
Peas, per sugar bag	1s. 5d. to 13s.
Potatoes (Sweet), per sugar bag	2s. to 4s.
Pumpkins (table), per ton	£4 15s. to £4 17s. 6d.
Rhubarb, per dozen bunches	9d. to 2s. 3d.
Tomatoes, per half-bushel case	3s. to 6s. 9d.
Turnips (Swede), per dozen	4d. to 6d.

SOUTHERN FRUIT MARKETS.

Article.	APRIL. Prices.
Bananas (Tweed River), per double case	13s. to 16s.
Lemons, per bushel case	7s. to 15s.
Pineapples (Queens), per double case	10s. to 15s.
Pineapples (Ripleys), per double case	5s. to 7s.
Pineapples (Common), per double case	5s. to 7s.
Oranges, (Queensland), per case	20s. to 25s.
Oranges (Other), per case	3s. to 10s.
Tomatoes, per half bushel case	2s. to 3s.
Passion Fruit, per half bushel case	8s. to 18s.
Peaches per bushel case	2s. 6d. to 7s.
Pears, per bushel case	5s. to 10s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, (Imported), per bushel case	5s. to 15s.
Apples, Cooking, (Imported), per bushel case	7s. to 11s.
Bananas (Cavendish), per dozen	3½d. to 8d.
Bananas (Sugar), per dozen	3d. to 9d.
Citrons, per cwt.	8s. to 9s.
Cocoanuts, per sack	£5
Grapes, per case	7s. to 9s.
Lemons (Lisbon), per half bushel case	3s. 6d. to 7s. 6d.
Persimmons, per half bushel case	5s. to 9s.
Rockmelon, each	6d. to 1s.
Oranges, per bushel case	5s. to 11s.
Oranges (Seville), per cwt.	13s.
Pineapples (Smooth), per dozen	1s. 4d. to 7s. 6d.
Pineapples (Rough), per dozen	7s. 3d.
Pears, per bushel case	10s. to 15s.
Papaw Apples, per tray	3s. 5d. to 7s. 6d.
Peaches	1s. 6d. to 4s. 6d.
Plums	5s. 6d. to 8s.
Quinces, per case	6s. to 8s.
Mandarins, per bushel case	16s.
Custard Apples, per tray	5s. to 7s.

TOP PRICES, ENOGGERA YARDS, MARCH, 1921.

Animal.	MARCH. Prices.
Bullocks	£16 5s. to £17 7s. 6d.
Bullocks (Single)	...
Cows	£10 5s. to £13 17s. 6d.
Merino Wethers	34s. 6d.
Crossbred Wethers	40s.
Merino Ewes	25s. 3d.
Crossbred Ewes	32s. 9d.
Lambs	35s. 3d.
Pigs (Backfatters)	...
Pigs (Bacon)	...
Pigs (Porkers)	67s.

Farm and Garden Notes for June.

FIELD.—Winter begins on the 24th of this month, and frosts will already have been experienced in some of the more exposed districts of the Southern coast and on the Darling Downs. Hence, insect pests will, to a great extent, cease from troubling, and weeds will also be no serious drawback to cultivation. The month of June is considered by the most successful lucerne-growers to be the best time to lay down this crop, as any weeds which may spring up in the event of a dropping season will be so slow-growing that the young lucerne plants will not be choked by them.

The land should now be got ready for millets, sorghums, panicum, &c. Oats, barley, vetches, clover, tobacco, buckwheat, field carrots, and Swedes may now be sown. Some advocate the sowing of early maize and potatoes during this month, but, obviously, this can only apply to the more tropical parts of Queensland. The land may be got ready, but in the Southern districts and on the tableland neither maize nor potatoes should be planted before August, or at the earliest, in warm, early districts, at the end of July. There is always almost a certainty of frosts, more or less severe, during these months. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn or in the open, if the weather be fine. In pitting them or storing them in hills lay them on a thick layer of sand, then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them. Then put down another layer of tubers, and repeat the process until the hill is of the requisite size. The sand excludes the air, and the potatoes will keep right through the winter. Late wheat may still be sown, but it is too late for a field crop of onions. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Cuttings of cinnamon and kola nut tree may be made, the cuttings being planted under bell glasses. Collect divi-divi pods and tobacco leaves. English potatoes may be planted. The opium poppy will now be blooming and forming capsules. Gather tilseed (sesame), and plant out young tobacco plants if the weather be suitable. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas, Fibre may be produced from the old stems. A hand machine for this purpose was once introduced into Queensland from France, which would turn out 65 lb. of clean fibre in a day of ten hours; but it proved to be unworkable.

KITCHEN GARDEN.—Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted, also horse-radish can be set out now.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Land for early potatoes should now be got ready by well digging or ploughing.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

FLOWER GARDEN.—No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool, moist spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of

plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses, and tie up, without pruning, to trellis or stakes, the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondii*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds; mignonette is best sown where it is intended to remain.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 in., and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly, so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days, thin out so as to leave each plant (if in the border) at least 4 to 6 in. apart.

Orchard Notes for June.

THE SOUTHERN COAST DISTRICTS.

The Notes of last month, referring to the care to be taken in the handling and marketing of all kinds of citrus fruits, apply with equal force during this and subsequent months till the end of the season.

Keep the orchard clean, and work the land to retain moisture. The handling of the citrus crop is the main work in many orchards, but where slowly acting manures are to be given their application should not be later than this month. They should be well mixed with the soil, so that when the spring comes and the trees start a fresh growth a certain percentage of plant food will be available for the trees' use. Heavy pruning should be done now, whilst the trees are dormant. All large limbs should be cut off close to the main stem; the edges of the cuts should be carefully trimmed, and the whole wound, if of large size, covered with paint or grafting wax, so that it will not start to decay but soon grow over. When the soil of the orchard is becoming deficient in organic matter, the growing of a Winter green crop, such as mustard or rape, is well worth a trial. Clear the crop of fruit from the part of the orchard to be so treated. Plough the land well; work the soil down fine so as to get a good seed bed, and broadcast the mustard or rape. A manuring of 4 cwt. of meatworks manure and 1 cwt. of sulphate of potash per acre will produce a very heavy crop of green manure, and the plant food not required for the production of such crop will be still available for the trees' use in Spring.

Pineapples and bananas should all be cleaned up, and the land got into first-class order. Pineapples, where at all liable to frost, should be covered with grass or other suitable material. The growth of weeds between the rows of pines on land liable to frost is one of the best ways of encouraging frosts, as frost will strike dirty, weedy ground, and severely injure the pines growing thereon, when it will do little, if any, damage where the land is kept perfectly clean—another advantage of cleanliness in cultivation.

THE TROPICAL COAST DISTRICTS.

Keep the land well cultivated—plough when necessary to bury weed growth, and get the surface of the ground into a state of thorough tilth, as moisture must be retained in the soil by cultivation to mature the Spring crop of fruit. This applies not only to oranges and other tree fruits, but to bananas and pines as well. A good start in Spring means good bunches of bananas and early-ripening pineapples. Heavy pruning can be done now in the case of all trees not carrying a heavy crop of fruit; but where citrus trees are heavily loaded, the pruning should be put off till after the Spring crop of fruit has been gathered. The spraying of the trunks and inside of the trees with the lime and sulphur wash can be carried out, and where Maori is making its appearance the sulphide of soda wash should be used as well.

THE SOUTHERN AND CENTRAL TABLELANDS.

The pruning of all kinds of deciduous fruit trees is the chief work of the month in the Stanthorpe district. Do not be frightened to prune severely—first, in the case of young trees, so as to get strong well-grown trees instead of straggling top-heavy trees; and, second, in the case of trees that are going off in the size and quality of their fruit. Where peaches, apricots, plums, or nectarines are only making very little growth and that weak, so that the fruit produced thereon is small, it is advsable to head the tree hard back, so that it will throw out some vigorous branches in Spring that will form a new head for the tree. Apples, as well as plums and apricots, are sometimes inclined to over-produce fruit spurs, which become long and straggling, and bear a large quantity of small-sized fruit. A vigorous shortening back and cutting out of such spurs will have a very beneficial effect in the quality and size of the fruit produced.

Gather and burn all prunings; and where codlin moth is present in the orchard, examine the tree carefully when pruning it, so as to see if there are any cracks, crevices, or masses of loose bark, in or under which the larvæ of the moth may be hibernating. All larvæ so found should be destroyed, and if the work is carried out systematically it will tend to materially decrease the crop of moths that will hatch out the following Spring.

As soon as any part of the orchard is pruned, gather up the prunings and work the land, as a thorough winter weathering of the soil is very beneficial in its effects; and, further, it will tend to destroy many insects that may be wintering in it. The planting of new orchards or of trees to replace any that may have died, or that have been proved to be unsuitable to the district, may be continued during the month, and right on till the end of Winter.

Do not prune vines in the Stanthorpe district, as it is advisable to leave the pruning as late as possible, but vine-pruning can be done at any time now in the Roma or Central districts. Tree-pruning can be continued during the month, and the orchard should be kept well worked. Citrus fruits can be marketed. Lemons should be gathered and cured.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	MAY.		JUNE.		JULY.		AUGUST.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6 31	5·0	6 39	5·3	6·30	5·18
2	6·14	5·16	6·31	5 0	6·39	5·3	6·30	5·18
3	6·15	5·15	6·32	5·0	6 39	5·4	6·29	5·19
4	6·15	5·14	6·32	5·0	6·39	5·4	6·28	5·19
5	6·16	5·13	6·33	5·0	6·39	5·5	6·27	5 20
6	6·16	5·13	6·33	5·0	6·39	5·5	6·27	5·21
7	6·17	5·12	6·34	5·0	6·39	5·5	6 26	5·21
8	6·17	5 11	6·34	5 0	6·39	5·6	6·25	5·22
9	6·18	5·10	6·34	4·59	6·39	5·6	6·25	5·22
10	6·18	5·10	6·35	4·59	6·40	5 6	6·24	5·23
11	6·19	5·9	6·35	4·59	6·40	5·7	6·23	5·23
12	6·19	5·8	6·35	4·59	6·39	5·7	6 22	5·24
13	6·20	5·8	6·35	4·59	6·38	5·8	6·21	5·24
14	6·20	5·7	6·36	4·59	6·38	5·8	6·20	5·25
15	6·21	5·7	6·36	5·0	6·38	5 9	6·19	5 25
16	6·22	5·6	6·36	5·0	6·37	5·10	6·18	5·26
17	6·22	5·5	6 37	5 0	6·37	5·10	6 17	5·26
18	6·23	5·5	6·37	5·0	6·37	5·11	6·16	5·27
19	6·23	5·4	6·37	5·0	6·36	5·11	6 15	5·27
20	6·24	5·4	6·38	5 0	6·36	5·12	6·14	5·28
21	6·24	5·3	6·38	5 1	6·36	5·12	6·14	5·28
22	6·25	5·3	6·38	5 1	6·35	5·13	6·13	5·28
23	6·26	5·3	6·38	5 1	6·35	5·13	6·12	5·29
24	6·26	5·2	6·38	5·1	6·35	5·14	6·11	5·29
25	6·27	5·2	6·39	5 1	6·34	5·14	6 10	5 29
26	6·28	5·2	6·39	5·2	6 34	5·15	6 9	5·30
27	6 28	5·1	6·39	5·2	6·33	5·15	6 8	5·30
28	6 29	5·1	6 39	5·2	6 33	5·16	6·7	5·31
29	6·29	5·1	6·39	5 2	6·32	5·16	6·6	5·31
30	6·30	5·0	6·39	5·3	6·32	5·17	6·5	5·32
31	6·31	5 0	6 39	5·3	6·31	5·17	6·4	5·32

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland, New South Wales, and Victoria, where the clock time is identical).

			H.	M.	
8 May.	●	New Moon	7	2	a.m.
15 „	☾	First Quarter	1	25	a.m.
22 „	○	Full Moon	6	15	a.m.
30 „	☽	Last Quarter	7	45	a.m.

Perigee on 12th at 6·12 a.m.
Apogee on 27th at 8·48 p.m.

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6 June	●	New Moon	4	14	p.m.
13 „	☾	First Quarter	7	0	a.m.
20 „	○	Full Moon	7	41	p.m.
28 „	☽	Last Quarter	11	17	p.m.

Perigee on 8th at 6·54 p.m.
Apogee on 24th at 11·42 a.m.

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5 July	●	New Moon	11	36	p.m.
12 „	☾	First Quarter	2	16	p.m.
20 „	○	Full Moon	10	8	a.m.
28 „	☽	Last Quarter	12	20	p.m.

Perigee on 6th at 10·54 p.m.
Apogee on 21st at 8·18 p.m.

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4 Aug.	●	New Moon	6	17	a.m.
11 „	☾	First Quarter	12	14	a.m.
19 „	○	Full Moon	1	28	a.m.
26 „	☽	Last Quarter	10	51	p.m.

Perigee on 4th at 7·48 a.m.
Apogee on 17th at 10·54 p.m.

No Eclipse of the Sun or Moon will occur till October.

On 2nd July, between 3 and 4 p.m., an interesting occultation of the planet Venus will be taking place; but in Queensland the only thing observable will be the juxtaposition of the two, and binoculars will be required as it will be day-time. The position will be about half-way down to the west of the Sun.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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